

# The Chemical Age

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## Contents

EDITORIAL NOTES : The Problem of Chemical Corrosion ; Germany and the Fuel Problem ; China as a Fertiliser Market ; Improvement in Leaching Methods ; German Potash Sales .....	PAGE
The Problem of Corrosion and Its Prevention .....	183
Correspondence : " Fluorine and Cancer " .....	186
Acid Resisting Materials and Their Application .....	188
Research on Atmospheric Corrosion : Second Report .....	189
Reviews .....	193
" C.A. " Queries .....	194
From Week to Week .....	195
References to Current Literature .....	196
Patent Literature .....	197
Weekly Chemical Prices and Market Reports .....	198
Company News ; New Chemical Trade Marks ; Chemical Trade Inquiries, etc. ....	203
Commercial Intelligence : New Companies Registered .....	208
	210

**NOTICES** :—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Communications relating to advertisements or general matters should be addressed to the Manager.

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## The Problem of Chemical Corrosion

To no industry is the problem of corrosion and the means of preventing or at least arresting the corrosive processes of more direct and practical interest than to the chemical industry. To begin with, the operations proceeding in a chemical works expose the plant to the severest possible tests, and not only the actual plant but floors, roofs, walls, etc., as well. The cost of making good the loss caused by corrosion is a serious item. In recent years intensive study has been directed on the subject, with good results. Not only are the physical or chemical causes of corrosive action better understood than formerly, but never before had the chemical engineer so wide a choice of helpful materials, such as specially prepared acid-resisting metals and alloys, enamels capable of withstanding great heats and strong acids, protective coatings and enamels for surface treatment, special cement preparations such as " Prodrorite," and a wide range of chemical stoneware. The more progressive firms have fully recognised for some time the importance and the actual economy of employing such materials according to their particular needs. Not only is the life of the plant greatly prolonged, but its working efficiency is

increased. The degree of purity demanded in chemical products to-day is higher than ever before, and it is therefore increasingly important that as far as possible the raw material of chemical apparatus should correspond in composition with the materials undergoing treatment.

The great progress made in all these directions is due to a combination of effort in attacking the problem. A first place in this effort must be given to the research worker, who, confronted with the troubles of the works manager, has set out to discover the fundamental cause. The metallurgist has admirably complemented his work by the production of such materials as chromium and chromium-nickel steels, cobalt, nickel-copper, aluminium and silicon alloys. Finally, the chemical engineer, in his willingness to adopt new materials of construction, has greatly encouraged the demand for the best available types of plant and assisted in raising the quality of the product.

Side by side with the progress in metallurgy, there has been a marked advance in the ceramic industry. For the earlier experiments in chemistry, clay vessels had largely to be used, and to-day the same material, in a greatly improved state, is still of great and varied service. Excluding the immense field of refractories and special ceramic products of limited application, the various silicate products used for chemical processing include glass, fused silica, enamelled iron, and chemical stoneware. The last may be considered the most important, since it is the most durable of all clay products. It is highly resistant to acid attacks ; in fact, completely resistant except to substances that also affect glass, such as hydrofluoric acid and hot strong caustic alkalis. Physically, stoneware is an aggregation of more or less refractory particles of ceramic material in various stages of fusion, bonded together by means of a vitrifying clay, usually with the addition of a flux. It is capable of such wide modification that at one extreme it may be as coarse and porous as firebrick, while at the other it may be as fine and dense as porcelain. That fact alone indicates the wide range of its application and at the same time the almost infinite variety of shape into which it may be cast.

Apart from the materials mentioned, together with non-corrosive flooring or roofing material, there is a very wide selection available to-day of enamels, glazes, and protective paints and varnishes. These are mainly applied—though enamels are also used for jacketing chemical pans and vats subjected to considerable heat—for protecting plant and buildings against atmospheric corrosion, which is particularly active in chemical works. A glance back over the work on corrosion done in recent years is sufficient to reveal the immense progress made in all directions,

and the chemical manufacturer of to-day is able to cope with the trouble by means of materials unknown to his predecessors.

### Germany and the Fuel Problem

REPORTS continue to reach us respecting the steady progress that Germany is making industrially, and especially in chemical activities. Many of these come from American visitors who are sent over on tours of inspection to Europe, and who, though they are but passing spectators liable to judge too much from superficial appearances, have nevertheless opportunities of forming a judgment on the general condition of things. What most impresses such visitors to Germany is the intensive work now proceeding on processes for the production of synthetic fuel. It is understood that the number of Bergius process units now installed is to be largely increased in the near future, and it is estimated that when these are in full operation, their output will amount to one-fourth of Germany's liquid fuel needs. Of course, this is a speculative estimate that may or may not be realised, but the Germans at least appear to have faith in it. It is, however, a point to be remembered that the new fuel is not yet generally on the market.

The recent understanding between Germany and the Standard Oil Co. has no immediate bearing on the fuel position in the United States, because on present prices no synthetic fuel can compete commercially with the natural product, but it may be important as a reserve against the time when the American natural supplies fail to equal the current needs. The life-time of the American oil supplies—or at least the period within which demand will overtake supply—has been fixed by some authorities as low as six or seven years, and national interest in the matter is naturally keen. The resources of science are now being called in with a view to increasing the yield from existing properties rather than prematurely developing new ones. In the case of many of the existing wells, the production of the first 10 to 15 per cent. of the total potential capacity is an easy matter, but as the percentage rises the difficulties increase, and it is doubtful where anything like the total content of oil could ever be extracted at a reasonable cost. The tendency in the United States, however, is clearly to conserve the natural supplies, first by working the existing oil properties more thoroughly with the aid of the best scientific advice, and secondly—though this is only a contemplated measure at present—by placing some restriction on the potential supplies. The American desire to have a share in any alternative synthetic supplies is quite reasonable, and the agreement with Germany is adequately explained on this ground.

As to the general conditions in the United States and Europe, a shrewd American estimate may be worth quoting. There is, we are frankly told, too much money in America, a naïve confession which one cannot help contrasting with the facility with which the United States continues to absorb our interest payments on war liabilities. As regards Germany, a recent impression of one who has seen much of its technical industries from the inside is that the country is steadily recovering as the result jointly of its generous

utilisation of the services of science, of its sound traditional team work, and of the readiness of the people to settle down to hard work. Progress in Great Britain is not quite so palpable to the passing observer. That may be partly because of the deadening effects of the coal strike which are still operating in various ways. It may also be due to the fact that we have been struggling to maintain a dead level, while Germany, having dropped to the bottom, is gradually creeping up again, and this mere recovery of lost ground may easily look more like positive progress than it really is.

### China as a Fertiliser Market

GIVEN stable and progressive conditions, China should be one of the greatest markets in the world for chemical fertilisers; the present area of land under cultivation is estimated at about 225 million acres. In some parts, notably Central China, the farmers raise two and sometimes three crops annually, while in the subtropical south three crops are usually produced, and in market gardening areas even four. That the fertility of the soil has not been completely exhausted is due to the fact that considerable wastage from homes and farmyards is put back into the land, and is often supplemented by local fertilisers such as beancake, cottonseed cake, woodash, lime, and mud.

Imported chemical fertilisers are reported to be gaining in popularity on the Foochow market. A group of firms, including Brunner, Mond and Co., Associated Products Co., Hung Mou, Feng Mou, Tai Mou Co., and Ho Chung Seng, are importing chemical fertilisers for the Fukien farmers in increasing quantities. The fertilisers sold by these companies consist chiefly of Chile saltpetre and ammonium sulphate, the price varying with the different brands, from £2 to £2 16s. per hundred catties (roughly one catty equalling 1 and  $\frac{1}{2}$  pounds). The fertiliser sold under the Wang Tao Brand by the Ho Chun Sheng Co., a Chinese firm that operates chiefly from the Philippine Islands, is popular with the Fukien farmers. It is made of beancake and bone dust, and has proved suitable for the soil of the Fukien province. Brunner, Mond and Co. are understood to have the largest sales in the district, although their new rival, Ho Chun Sheng, is making progress, that firm alone having imported no less than 10,000 piculs into Foochow during the past few months. The annual sales of the Associated Products Co. are in the neighbourhood of £20,000.

It should be noted by English firms intending to cater for the Chinese market, that different kinds of fertiliser are applied to the crops either before or after the planting of the rice seedlings. In the former case, the fertiliser is first mixed with pulverised clay in the proportion of 20 catties to every 70 or 80 catties of earth. The admixture is then broadcast over the fields a day or two before the transplantation of the rice seedlings. With the help of the fertiliser, the rice grows much more quickly and yields abundant crops. In the latter case the fertiliser is mixed with pulverised earth in the same manner, but the admixture is applied to the rice plants about 10 days or a fortnight after the planting of the rice seedlings, care being taken that the fertiliser does not come in contact with the roots of the

plants. Generally from 15 to 20 catties of the fertiliser are used to the mow (one-sixth of an English acre), the quantity varying according to the natural fertility of the soil. A too liberal application, however, tends to hurt the crops. The farmers have found that chemical fertilisers have the advantage of killing harmful insects in the rice fields, and, that although higher in price than natural fertiliser, it is more profitable because of the increased yield secured. Much of the chemical fertiliser imported into Foochow is transhipped to other coastal regions and the back country districts.

### Improvement in Leaching Methods

A METHOD for the agglomeration of the slime and fine particles in the leaching of ores, discovered as the result of experimental work by the United States Bureau of Mines, is considered to offer promise of a wide application in the metallurgy of copper and other ores. Hundreds of millions of tons of tailings from copper concentrators, too low grade for treatment by other processes, present possibilities of successful treatment by this method. Under the new method, the slime and fine particles can be agglomerated, and the state of agglomeration maintained in such a manner that masses of ore containing finely divided material can be made permeable to downward trickling leaching solutions, provided open drainage is maintained at the bottom and that the solutions are not allowed to pool on the surface. In the process of agglomeration the slimes are caused to adhere to the larger particles or cohere together. To accomplish this, the dry crushed ore or other material is moistened with water or leaching solutions simultaneously with mixing until the desired agglomeration is attained. Surface tension, capillarity, and other surface forces cause the agglomerated particles to hang together and permit diffusion of the leaching solution as films throughout the charge. It is necessary to have a top layer of ore without slimes to get an even distribution of solution and prevent disintegration of the aggregate particles.

Experiments have shown that the increase in possible percolation rate produced by agglomeration with open drainage is between 5 and 40 times, depending upon the character and proportion of the slimes present. By this method, also, advantage can be taken of oxygen from the atmosphere entering into the chemical reaction of leaching. The principle is also of value in vat leaching, as it tends to prevent channeling of the solutions through the ore. The development of this principle should make it possible to treat finely-divided ore or tailings by heap leaching principles, and thus avoid costly tank construction. Enormous tonnages of tailings from copper concentrators have accumulated, containing from .2 to nearly 1 per cent. copper. At many places this copper is amenable to leaching, but the treatment by present practices is too costly for the grade of the material. Should the principle of agglomeration prove practical, much of the copper now tied up in the tailings piles can be made available for use. The method is also particularly applicable to ores that tend to slime in crushing or which require relatively fine division to liberate the values. Not only may finely-divided material be leached by this

method, but clear effluent liquors may be obtained without filtering. Laboratory tests have indicated that the leaching of agglomerated material by the open-drainage principle does not necessarily require longer time of contact with the leaching solution than does standard vat leaching. Under proper conditions this method has shown more rapid leaching and better washing than when the ore is flooded with solution.

### German Potash Sales

THE Department of Overseas Trade learns from H.M. Consul-General at Cologne (Mr. W. N. Dunn) that, according to figures issued by the Statistical Reich Office and published in the *Deutsche Bergwerks Zeitung* of August 9, the production of German potash salts in 1926 was 94 mill. dz. (1 dz.=100 kgs.) actual weight with 12·6 mill. dz. pure potash. Thus the potash output, as compared with 1925, has decreased by 21·9 per cent., but is still considerably higher than in 1924, and, comparatively speaking, falls little short of 1913. The rationalisation of the potash mining industry is seen from the fact that of the 228 potash works, to which a participation figure has been allotted, only 66 participated in the output of 1926 on a monthly average, as against 85 in 1925 and 126 in 1923. Sales in potash salts have decreased from 43·26 mill. dz. with 12·25 mill. dz. pure potash in 1925 to 38·94 mill. dz. with some 11 mill. dz. pure content or 10 per cent. Of the amounts sold in 1926, 26·35 mill. dz. with 6·94 mill. dz. pure potash were sold on the home market and 12·59 mill. dz. with 4 mill. dz. pure potash abroad. The decrease as compared with 1925 amounted to 11·5 per cent. as regards export sales and 9·5 per cent. as regards inland sales.

### Books Received

**PHOSPHORIC ACID, PHOSPHATES, AND PHOSPHATIC FERTILISERS.** By Wm. H. Waggoner, assisted by Henry W. Easterwood. American Chemical Society Monograph Series. New York: The Chemical Catalog Co. Pp. 370. \$7.50.

**TRANSACTIONS OF THE INSTITUTION OF CHEMICAL ENGINEERS.** Volume 4, 1926. London: The Institution of Chemical Engineers. Pp. 209.

**FATS and WAXES.** By T. P. Hilditch. London: Balliere, Tindall and Cox. Pp. 461. 18s.

**SECOND EXPERIMENTAL REPORT TO THE ATMOSPHERIC CORROSION RESEARCH COMMITTEE.** A Discussion held by the Faraday Society, March 30, 1927. London: The Faraday Society. Pp. 100. 8s. 6d.

**INDUSTRIE DER HOLZDESTILLATIONS-PRODUKTE.** By Dr. G. Bugge. Dresden and Leipzig: Theodor Steinkopff. Pp. 206. 16.50 RM. (In German.)

**LATEX.** By Dr. Ernst A. Hauser. Dresden and Leipzig: Theodor Steinkopff. Pp. 231. 17.50 RM. (In German.)

### The Calendar

Aug. 28-	International Industries Fair.	Leipzig.
Sep. 3		
Aug. 31-	British Association for the Advancement of Science: Annual Meeting	Leeds.
Sep. 7		
6-9	Institute of Metals: Autumn Meeting, Shipping, Engineering and Machinery Exhibition.	Derby. Olympia, London, W.
8-24		

## The Problem of Corrosion and its Prevention

### A Review of Available Methods

*The following account of the prevention of corrosion, although dealing more specifically with ferrous structures, still has some application to metals other than iron. It is extracted from Mr. A. A. Pollitt's book on "The Causes and Prevention of Corrosion," published by Ernest Benn, Ltd. (pp. 230, 25s.).*

THE methods available for the prevention of corrosion are as follows:—

1. Prevention by means of oxide and non-metallic coatings.
2. Prevention by means of metallic coatings.
3. Prevention by means of paints and like materials.
4. Prevention by processes of water purification.
5. Prevention by means of electrolytic methods.

The first three classes function by excluding corrosive influences or preventing their access to the metal surface, and they are widely employed on both structural and other classes of material. Methods 4 and 5 operate by removing corrosive influences, or in the last case by overcoming them, and are principally confined to the alleviation of corrosion troubles which arise in the various units of steam-raising plants, and which constitute one of the most important of corrosion problems.

There might also be included various precautions, which in themselves appear somewhat trivial and insignificant, and which may, in fact, be actually of but minor importance, for there is little doubt that of the forces working for corrosion, those external to the metal are very much more powerful than those inherent in the metal and are more rapid in action, and that to seek to correct these latter is, more often than not, incompatible with mechanical and other requirements. Nevertheless, when these precautions are disregarded, they add to the total of the corrosive forces which attack the metal. If they are appreciated and paid the attention they merit, the useful period of service of the metal may often be increased by an acceptable percentage. Many of these points will present themselves conveniently in other portions of the text, but some of the more significant will now be briefly considered.

#### Care in the Manufacture of Material

The first precaution is one which gets well down to the root of the problem, but it is, unfortunately, one which is not readily put into practice, namely, care in the manufacture of the material. It is generally accepted that the careful control of impurities and the homogeneous and uniform distribution of essential constituents, coupled with a suitable and carefully controlled heat treatment, will go far towards improving the resistance to corrosion of iron or of steel, simply by ensuring a uniform product.

The craze for tonnage is probably responsible to a large extent for the reputed poor resistivity of many modern commercial irons and steels. High-speed production and methods of working tend to result in a metal which is porous, heterogeneous, and contains occluded gases and various other impurities and in which are developed internal stresses and strains and segregations, all of which are detrimental from the point of view of resistivity to corrosion. The remedy lies, of course, in more carefully controlled production and subsequent working and in annealing wherever possible. For immediate economic reasons these points are often disregarded (except, of course, where such treatment is essential to desired mechanical properties), since most of the metal produced receives some form of protective coating when put into service, and it must be admitted that in many cases this disregard is justified, not only for immediate, but also for general economic reasons.

There is a wide range of material, however, which, by reason of the nature of its service, must remain unprotected. The mechanical conditions, for instance, may be so severe that no protective coating could survive even a few hours, and other alternatives which may be available in the case of boiler tubes and economisers, etc., are equally impracticable. The preservation of this particular class of material would seem to be attainable only through an increased resistivity resulting from chemical purity and uniformity. This is almost entirely in the hands of the manufacturer.

It is of little value to contrast unfavourably our modern products with those of olden days. Obviously there is no

comparison between the conditions under which the older material served and those to which most of the present-day material is subjected in the large industrial areas. The prevailing industrial atmospheric and general conditions are such that the best of the old materials would require artificial protection of some kind to ensure their permanence, that is assuming, of course, that they would fulfil the mechanical requirements. It would not seem worth while, therefore, to revert to the older and more tedious methods of production in order to obtain material which, in itself, is but a few degrees more resistant and which will still require the same artificial protection which is given to our modern metals. In many instances the mechanical conditions to which metals are subjected whilst in service may often be directly responsible for lowering their resistivity. Metal may be strained beyond its elastic limit, for example, and this, as we know, is equivalent to facilitating electrolytic action.

#### Importance of Correct Structural Design

The design of structural material is another point to which attention might be drawn. In this class of material there occur opportunities for putting into practice certain precautions which may have beneficial effects on the life of the structure. Care in design can be directed not only to reduce the risks or severity of corrosion, but also to facilitate the employment of protective measures. Wherever possible, the avoidance of lodgment places for moisture and rain should be an objective. In large structures this is not easy and is frequently impossible to arrange for, yet it may often happen that severe local corrosion, due directly to such lodgments, occurs in places where it dangerously weakens the whole structure, whilst the bulk of the material remains almost perfect in condition. It may readily be imagined, for instance, that continued corrosion at the feet of tie-rods and stay-bolts, etc., is a lively source of danger, and it is usually found that these places are the ones most difficult of access to workmen when the structure is being repainted. The corrosion products cannot be efficiently removed by the scrapers, and the new paint is then applied to surfaces to which are adhering flakes of rust and which are also often damp. The best of paint applied under such conditions is of little use; corrosion proceeds underneath it, and the accumulation of rust pushes away and detaches it in a short time, and then the local conditions are just as bad as before the paint was applied.

The design should be such as to permit of ready accessibility to all parts for inspection, cleaning and repainting purposes. Unnecessary and ornamental elaborations on large structures are best omitted in order to facilitate cleaning and repainting, and on these occasions the cleaning should be thorough both with regard to old paint and to the complete removal of all patches of rust. This latter point is one which is often imperfectly carried out, if not altogether neglected.

#### Effect of Use of Dissimilar Metals

Contact between dissimilar metals, and even between different types of the same metal, should be avoided wherever possible. The reasonableness of this observation is well illustrated by the measure of protection which may be afforded to iron by those methods which involve the properly controlled contact between it and a dissimilar metal. The dissimilar metal employed in these processes is zinc, which, having regard also to supplies and cheapness, is the most electro-positive metal to iron. If appreciable protection can be thus obtained by a controlled galvanic stimulus, it is clear that the same stimulus, if uncontrolled in direction, can effect a considerable acceleration in the rate of the destruction of the iron. Much of the non-ferrous material used in connection with iron and steel is electro-negative to these metals and may therefore directly assist in their corrosion.

No two varieties of ferrous material are electrically neutral to one another, and if in contact the corrosion of the more

electro-positive metal will be accelerated by the presence of the less electro-positive variety.

Where mechanical requirements will permit, regard should be given to these considerations. From a purely corrosive point of view, it is not the best practice, for instance, to build a condenser of which the shell is cast iron, the tubes of 70/30 brass, and the tube plates of some other copper alloy, or to rivet boiler plates with any kind of rivets other than those made from the same material as the plates.

In many cases it is possible to determine precisely what are the most severe or virulent corrosive influences, and material should be chosen, for service under these conditions, which has been proved by experience to be the most capable of resisting them. Somewhat similar considerations apply also in the choice of protective coatings; thus a galvanised or other form of zinc-coated surface would not be chosen for service where the conditions were known to be acid.

#### Various Protective Coatings

Attempts have been made to produce sulphide and phosphide protective coatings on iron. The first, and apparently the only successful technical process for obtaining a phosphatic coating was that introduced by Coslett, and it is one of comparatively recent origin, being developed in 1907. The material to be treated is first suitably cleaned by pickling or sand-blasting and then immersed in a hot solution for periods which are varied according to the nature of the articles and the thickness of the coating desired. The deposition of the coating is analogous to the deposition of copper on to iron when the latter is placed into a solution of copper sulphate. The solution is prepared by mixing iron filings and concentrated phosphoric acid into a paste and then adding this to a weak boiling solution of phosphoric acid. Zinc filings are sometimes used together with or even instead of iron, and in this latter case the phosphatic coating may be looked upon as the result of an interchange of metallic bases.

The coating is produced mainly at the expense of the surface layers of the material which is being coslettised. The phosphatic coating itself is very resistant to normal, saline and acid atmospheres and to sea water. It is not, however, so well fitted to withstand wear or abrasion as are certain other forms of protection, and is generally less resistant to acids than the magnetic oxide coatings. It is much cheaper, however, and more simple to produce, and the process gives more uniform, and hence more reliable, results. A patented modification of the coslettising process is that known as the "Parkerising" process. It differs from its forerunner by adding to the original coslett solution a quantity of manganese dioxide, with a view to partially oxidising the ferrous phosphate. The resultant coatings are comparable in all respects to those produced by the coslettising solution.

#### Metallic Protective Coatings

Protective coatings of a metallic character are clearly divisible into two classes according to their electrical behaviour in relation to the metal to which they are applied:—

- (1) Electro-positive coatings.
- (2) Electro-negative coatings.

It is often contended that the application of the second class involves greater risks of the corrosion of the protected metal than does that of the first class, since, once their continuity is broken, the exposed metal beneath, being then the electro-positive component of a metallic couple, will corrode preferentially. This cannot be disputed, but it would seem desirable to point out, however, that probably the only difference in this respect between the two classes is a slight variation in the time factor. If the continuity of an electro-positive coating is broken and the protected metal exposed, the same influences which, in the above case, results in the preferential solution of the protected metal will, in the case of an electro-positive coating, result in the preferential corrosion and consequent removal of the protection, and in this way more completely expose the underlying metal to attack. Moreover, since iron stands fairly high in the electro-chemical series of the metals and has, therefore, a comparatively high solution pressure, it follows that any metal which is electro-positive to iron must have a higher solution pressure. Hence, the removal of a protective coating of such a metal, by influences which become operative when its continuity is broken, will be rapid. Electro-negative metallic coatings are typified by those of tin,

lead, and copper. These metals have low solution pressures, and on exposure to the usual atmospheric influences are attacked very slowly: the products of attack are protective, rather than otherwise, against further corrosion.

Of the metals electro-positive to iron, zinc is the one which commands most attention, by reason of its cheapness, easy application, and the quantities available. It is, in fact, with but one exception, namely, aluminium, the only metal which finds any extended commercial application as an electro-positive protective coating, and it is very extensively used. Zinc may be applied to iron by four methods: the hot-dip process, the sherardising process, the electrolytic process (zinc plating), and the spraying process.

The dipping and electrolytic processes are so well known as to need no further description. The sherardising process of applying protective coatings of zinc was invented by Sherard Cowper-Coles about 1900, and since 1908 has been increasingly applied to the treatment of a large variety of small articles, such as screws, bolts, and intricate castings, etc., which cannot be dealt with by the hot-dip process. Sherardising consists in packing the articles with zinc dust into drums, which are then placed in a small furnace, usually gas-heated, and either continually rotated at a slow speed by power or turned by hand through about 90° at frequent and regular intervals. The articles should, of course, be first cleaned to remove dirt, grease, and scale, and the heating of the drums is continued at the correct temperature and for the proper length of time, after which they are allowed to cool, opened, and the articles separated from the zinc dust by emptying on to a screen. The process is not applicable to large material such as sheet metal, etc., but pipes and similar goods may be fairly conveniently dealt with. A perfectly uniform coating is produced, alloyed with the surface of the protected metal. Further, if the process is correctly carried out and controlled, the surface layer of the coating consists of pure zinc.

#### The Schoop Spraying Process

The spraying or Schoop process is a novel one, but, as regards its use for applying zinc, it does not appear to have any special merit which would give it preference over the other methods, except, perhaps, that it is the most readily applicable to large material and structures. The apparatus consists of a sort of pistol to which are connected three flexible tubes, one for oxygen, one for hydrogen, and one for compressed air. The gases, oxygen and hydrogen, are burnt inside the pistol, and zinc, in the form of wire, is fed into the apparatus by means of a suitable device, operated by a small air motor. On reaching the flame of the burning gases, the zinc is immediately fused, and a strong blast blows it from the nozzle in the form of a spray which is directed on to the material being zinned. The velocity of the minute zinc particles composing the spray is said to be about 3,000 feet per second, and a few inches from the nozzle the temperature of the spray is so low that it may be directed on to the hand for a few seconds. It is therefore assumed that when the solid zinc particles hit the surface of the metal against which they are directed, the heat of the collision is sufficient to liquefy them and so ensure their adherence. A zinc coating of any thickness can be obtained in this way, but it is porous and costly. As a method for applying metal coatings generally, however, the Schoop process would appear to have a wide field of useful service.

Apart from the treatment of roofing material, the use of tin is mainly confined to the coating of cans and domestic utensils. It is not employed because it is electro-positive to iron; being, in fact, electro-negative; but because its solution pressure is so very low that it is extremely resistant to corrosion. It may be applied in a similar manner to zinc by a hot-dip process, but it appears to be a matter of great difficulty to produce, at any rate economically, a coating which is perfectly non-porous. Tin may also be applied electrolytically, though the method is not very extensively used. Copper and nickel are both applied by electrolysis, and although the processes call for a considerable amount of skill, the coatings produced are, for many purposes, without rivals. Like tin, copper is electro-negative to iron, but it resists most ordinary corrosive influences excellently, chiefly because the products of its corrosion protect it from further attack.

An account of the calorising process, which is primarily directed towards the prevention of the oxidation of metals subjected to high temperatures, deserves to be given. The

process consists in heating the material in a retort under a reducing atmosphere and in contact with a mixture of aluminium oxide and finely divided aluminium. A current of hydrogen is passed through the retort during the process and the articles are, of course, first thoroughly cleaned to remove grease and rust, or scale. The temperature employed in the operation is about 870° to 900° C. and there results an alloying between the metallic aluminium and the surfaces of the treated material. The depth to which the alloying penetrates can be controlled by varying the duration of the treatment and may range from a few thousandths of an inch to the complete permeation of the entire mass of the metal. The aluminium enters into solid solution with the metal, and the protection it affords is due to the formation of a surface layer of aluminium oxide or alumina which prevents the oxidising gases from coming into contact with the metal beneath it. Immediately below the layer of alumina is one of pure aluminium, then there comes a relatively thick layer of the iron-aluminium alloy, and below this is the base metal. The alloy is very hard, and should the outer coating of alumina be removed or destroyed by any means it is instantly replaced by the oxidation of the underlying aluminium.

Most metals, iron, steel, copper, nickel, brass, and monel metal, can be successfully calorised. Calorising was not originally intended to protect metals from corrosion, yet it has been found that in many cases it does actually give this protection. Brass and copper, when calorised, are much more resistant to brine and certain acid solutions, and calorised ferrous materials also offer increased resistance to many corrosive influences. Calorised tubes have been employed in condensers with very satisfactory results, and electrical material of treated copper appears to be quite unaffected by atmospheric corrosive influences.

#### Paints and Allied Coatings

Paints and like materials are so common and familiar that they are apt to receive but minor consideration with regard to the protection of iron and steel from corrosion, and the fact that they have a definite function in this connection may often be overlooked. Yet the extent of protection afforded to practically all structural materials is dependent upon the suitability and quality of the paints which are applied to them. Plating, galvanising and the other protective measures which have been dealt with up to now are of great value and are widely used, but they are not universally applicable. It would not be practicable, either from the point of view of cost or of the necessary plant, to plate, sherdise, or Bower-Barff the large girders, columns, and other components of steel and iron structures, and there are numerous other instances in which it would be too costly to apply such finishes, and in many cases, even if this were carried out, it would be necessary to employ a final paint finish for the sake of appearance and further protection. The importance of paints should not, therefore, be relegated to a secondary position in the consideration of protective coatings. They are often the only alternative by which protection can be given to iron and steel.

In order that a paint shall provide an efficient protection to the metal to which it is applied, it must conform to two essentials: (1) It must be impervious to moisture and (2) Its ingredients must be neutral or opposed to corrosive influences. From a consideration of the theory of corrosion, it may readily be conceived, for instance, that pigments which are basic in character and which, in the presence of moisture, tend to increase the concentration of hydroxyl ions, may be advantageously employed in a paint and will exert an influence in the right direction, even when the paint film is abraded or otherwise damaged, whilst pigments of an acid character, or which are liable to develop acidity on exposure, will prove unsatisfactory and detrimental, particularly if used in a priming coat.

#### Last Lead Works in Flint Closed

THE county of Flint has for centuries been noted for its lead works, and now the last of them has been forced to close down owing to slackness of trade and foreign competition. This is Walker Parker's lead works at Bagillt. The Halkyn mountains in the past have provided a vast store of rich minerals, and one noted lead mine there brought the owners over £1,000,000 in the course of a few years.

#### Fluorine and Cancer

To the Editor of THE CHEMICAL AGE.

SIR.—Your correspondent, "A Fertiliser Chemist," asks whether any comparison has ever been made between the fluorine-phosphorus ratios in human bones and teeth, in health and disease to-day and a century or so ago. Unfortunately no such comparisons have been made—which is partly due to the fact that it is scarcely a century ago that Ampère showed the true nature of hydrofluoric acid, and partly to the fact that the significance of small quantities of such elements and compounds had not at that time been recognised. It is doubtful if sufficient authenticated specimens of early nineteenth century teeth and bones from diseased cases would be available at the present time for the requisite data to be obtained.

The chemical and pharmacological literature of the last three decades, however, does not show that utter neglect of the value and significance of fluorine and its compounds in biological matters which your previous correspondent would lead us to suspect. During the last ten years about twenty papers on the biological significance of fluorine compounds have been published, quite apart from the work of Gautier, which tends to show that the fluorine content of healthy tissues varies with the proportion of phosphorus without being proportional to the latter.

The general trend of the research upon fluorine goes to show—

- (a) That excess of fluorine in the diet leads to defective dentition, very long and brittle teeth being produced, without polish.
- (b) That the bony tissues have the faculty of concentrating the fluorine ingested, excess of fluorine over the normal supply leading to a condition resembling osteomalacia.

In addition, an interesting series of German researches during the years 1895-1905 has shown that the aromatic fluorine compounds exert an accelerating effect on the epithelialisation of wounds. The most used compound of this class was difluorodiphenyl—a substance still obtainable commercially—whilst fluorphenetole and fluorseudocumene were also used to some extent. The effect of these compounds in this direction has, of course, been transcended by that of the cheaper compounds, such as the scarlet dyestuffs. It is interesting to note that fluoroform— $\text{CHF}_3$ —has practically no anaesthetic properties, although the antiseptic properties usually associated with the inorganic fluorine compounds persist in this gas, which was at one time used as a "cure" for tuberculosis (pulmonary); further investigations do not seem to have substantiated the claims which were originally made for it.

The action of these fluorine compounds in hastening epithelialisation, and the experiments of Maze, who showed that in the absence of small quantities of fluorine reproduction was inhibited, make it rather doubtful whether the compounds of this element would retard the uncontrolled cell division which is responsible for cancerous growths. However,

"Thoughts are but dreams,  
Till their effects be tried."

And with a subject such as cancer, experiments, not opinions, are alone of value.—Yours, etc.,

G. MALCOLM DYSON.

#### Australian Research on Tannin

WITH a view to making Australia independent of oversea suppliers of tannin, and so placing the tanning industry in the Commonwealth on a self-contained basis, the Australian Council for Scientific and Industrial Research for some time has been doing a great deal of research and experimental work in the preparation of tannin extracts. This work has been carried out at the council's laboratory, and in addition, important research on the commercial preparation of tannin extracts is proceeding rapidly in West Australia with the co-operation of the West Australian Government, the University, and the Council for Scientific and Industrial Research. A plant is being assembled there under the direction of a committee, comprising the Conservator of Forests (Mr. S. L. Kessell) and Professors Wilsmore and Whitfield.

## Acid-Resisting Materials and their Applications

### Notes on Various Products and Preparations

*It is increasingly recognised that enormous losses occur in industry through corrosion and its effects. It is, perhaps, in this direction that there is the greatest hope of effecting large economies in the chemical industry in the next few years. Below are given notes on various products which may be used in chemical works where corrosion due to acids is a problem: these products include acid resistant metals and alloys, enamelled ware, concrete, paints and bituminous preparations, etc.*

#### Regulus and Ironac Metals

Much attention has been given recently to the study of regulus metal, on account of its very extensive use for sulphuric acid—indeed, for many years this metal, which is an alloy of antimonial lead, has proved highly satisfactory as a medium for the construction of such parts of plant as acid valves, pumps, vessels, and other accessories for handling either hot or cold sulphuric acid. Regulus metal has so satisfactorily served the purpose of the acid manufacturer and the user of liquids containing sulphuric acid, that greater interest has been promoted in the study of this alloy, and, recently, the British Engineering Standards Association have taken in hand the standardisation of regulus metal, in order that users may secure the most satisfactory material for their purpose, and to ensure a constant and reliable quality. The only serious drawback in connection with equipment such as acid valves, pumps, and other parts made of regulus metal, is its softness. It is found to resist sulphuric acid and acid liquors excellently—it possesses a stability suitable for resisting all reasonable working pressures, and its toughness is sufficient for all reasonable chemical plant requirements, notwithstanding the softness already alluded to.

Haughton's Patent Metallic Packing Co., Ltd., who specialise so extensively in chemical works accessories of regulus metal, are also proprietors of Ironac, a metal of great resistance to corrosion of acids. Ironac comes to the rescue of the industrialist where regulus may fail, for, as distinct from the softness of the latter, Ironac shows extreme hardness. So hard indeed is this metal that machining is invariably carried out by grinding, instead of using machine tools or turning in the lathe. Whilst regulus metal has outstanding application to sulphuric acid, Ironac metal resists corrosion with nitric acid, in addition to sulphuric, and is thus applicable where lead alloys would entirely break down. A recent

and so arranged that the spindle and plug are lifted and lowered on the seating without rotating. This type of regulus valve has long been recognised as the safe standard for sulphuric acid by manufacturers of this acid; and it is now adopted by the artificial silk works, aniline dye works, oil refiners, and such industries where this acid has to be handled in considerable quantities.

It may be observed that among the later successful developments of both Ironac and regulus is the application of these metals for the construction of acid pumps. Figure I shows a pump of regulus metal as supplied for artificial silk works plant. Pumps made of regulus metal of this type have already been supplied by the company to most of the largest manufacturers of artificial silk, both in this country as well as on the Continent, whilst Figure II shows a group of Ironac pumps (electrically driven) made for a Japanese explosives works.

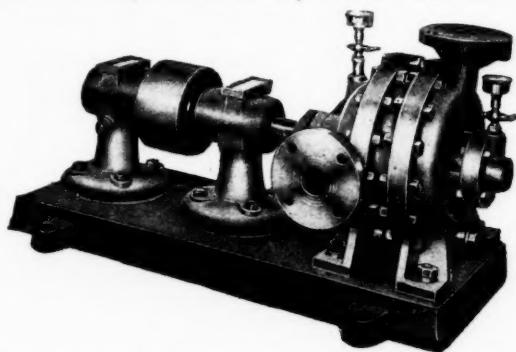


FIG. I.—A PUMP OF REGULUS METAL AS USED IN ARTIFICIAL SILK MANUFACTURE.

inspection of a piece of plant made of Haughton's Ironac, which had been in constant use for 12 years with nitric acid, showed that the surface of the castings was quite perfect, and there was no evidence of any corrosion from the acid. Probably it is on this account that the explosives works and aniline manufacturers employ Ironac metal so extensively for nitric acid plant, in fact, it is now quite usual practice to construct such plant as nitric acid condensers, denitrators, and condensers entirely of Ironac acid resisting iron—nor is it only the chemical manufacturer and acid manufacturer to whom these acid resisting metals appeal.

The large industries using sulphuric and nitric acids in the preparation of their products have come to realise the importance both of regulus and Ironac in the construction of their equipment. Among the products may be mentioned non-rotative acid valves which are made entirely of regulus metal,

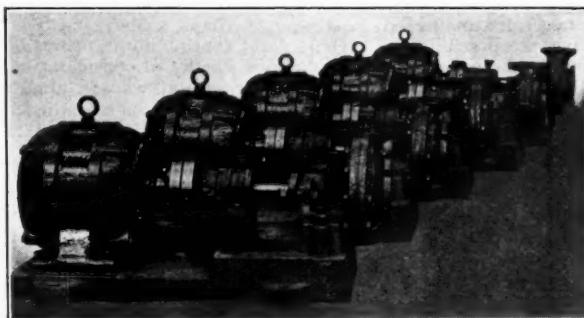


FIG. II.—A GROUP OF ELECTRICALLY DRIVEN "IRONAC" PUMPS FOR A JAPANESE EXPLOSIVES WORKS

It is necessary that the study of design of plant to deal with corrosive acids should be in the same hands as those engaged in the research and exploitation of acid-resisting metals such as regulus and Ironac; the two activities should be taken together, as the most successfully developed corrosion-resisting materials or metals may prove of little avail unless handled by competent designers and producers of such accessories as are required by the chemical manufacturer and the chemical user. It is in this dual capacity that Haughton's Patent Metallic Packing Co. specialise in the production of acid vessels, valves, pumps, elevators, condensers, concentrators, and pipe lines; and many other productions in the construction of which the above two metals are employed.

#### Nickel in Acid-Resisting Alloys

Nickel is interesting from an acid-resisting point of view principally owing to the measure of resistance to sulphuric and hydrochloric acids which it imparts to its alloys. Thus the chromium steels containing more than 14 per cent. of chromium, while they resist the attack of nitric acid quite well, are very little better than ordinary carbon steels in their resistance to the other principal mineral acids. The addition of nickel to these steels improves their resistance to attack by sulphuric and hydrochloric acids without affecting the behaviour towards nitric acid. The use of the nickel-chromium stainless steels (of which the "Anka," "Staybrite" and "Era" alloys are typical) is thus much wider than that of the older chromium stainless steels. It is not always realised, however, that increase of nickel content assists considerably in the power of these nickel-chromium steels of being worked, and that fabrication difficulties can often be overcome, without affecting general corrosion resistance, by specifying a slightly higher nickel content than is usual

When resistance to oxidation at high temperatures has to be considered, quite high nickel contents are often employed.

On the non-ferrous side, nickel-copper alloys of various nickel contents are now on the market. Although, in general, corrosion resistance increases with nickel content, this is not always the case, and chemical manufacturers would do well to consider which composition is best suited to their purpose. Often a troublesome case of slight corrosion can be met by the use of one of the lower nickel content alloys, though in the more serious instances one of the higher nickel alloys, such as "Corronil," will necessarily be used. This alloy, which is very resistant to a number of chemicals, has a wide field of application in the chemical and semi-chemical industries. The present-day availability of pure Mond nickel and electrolytic copper has made possible the production of a range of synthetic alloys particularly free from impurities. The importance of purity and accurate control of composition is, of course, now well recognised.

In the pure nickel-chromium alloys and the nickel-chromium-iron alloys containing nickel as chief constituent we have available some of the materials most resistant to a number of types of corrosion. Their use for high temperature work is, of course, well known, but they are being more and more utilised in chemical industry. An impeller made of one of these alloys, to which certain slight additions had been made, was recently taken out of a sulphuric acid plant. After three years' contact with acid of varying strength the impeller was practically unaffected. Although, perhaps, somewhat expensive, the possibility of keeping plant continually in operation makes the wider use of these alloys worthy of consideration. Both nickel itself and its high-content alloys are almost totally resistant to most alkalies, and the metal is used, for example, for handling caustic soda, both fused and in solution.

Nickel and its alloys are useful as corrosion resisters in so many different directions that a part of the staff of the Research and Development Department of the Mond Nickel Co. is continually engaged in studying a variety of corrosion problems. Their advice and experience as to the best alloy for use for any particular purpose is always available to anyone who has a corrosion difficulty.

### Monel Metal

Among acid-resisting materials Monel metal is well known. It is a natural nickel-copper alloy in a state of solid solution. One important feature claimed for Monel metal, apart from its great resistance to the corrosion of most acids and all

and engineers, in chemical works, textile factories, dyeing establishments, etc. Attached is a photograph of a very large autoclave ordered by one of the foremost chemical firms in the country, where Monel metal was specified for the internal lining. Each of these massive pieces of plant weighed over 10 tons empty. The modern hospital may not strike readers as a field where the need for acid-resistant materials is great, yet here also the adoption of Monel metal in recent times has been most extensive. Even hypodermic needles are now available in this metal. A wide range of products in Monel metal are being shown at the Shipping, Engineering and Machinery Exhibition at Olympia, from September 8 to 24, by G. and J. Weir, Ltd., the well-known engineers, of Cathcart, Glasgow, who are the sole European concessionaires for Monel metal. They publish much specialised literature on its use in different spheres of industry as well as domestic applications, and readers interested should write for their booklets.

### "Staybrite" Steel

A monograph on "The Development of 'Staybrite' Steel : Its Properties and Uses," has been issued by the producers of the steel, Thos. Firth and Sons, Ltd., of Sheffield, and contains data collected in the company's research laboratories. It is pointed out that in no sense is it intended that this Firth "Staybrite" steel shall replace Firth stainless steel. Stainless steel is a  $12\frac{1}{4}$  per cent. chromium steel having certain characteristics, notably resistance to corrosion, coupled with certain mechanical and other characteristics which render it particularly suitable, in one or other of its forms, for many applications in the industrial arts. Firth "Staybrite" steel is of different composition, having a much higher chromium content together with a substantial percentage of nickel, these conferring upon it, besides excellent corrosion- and acid-resisting qualities, mechanical and other properties which fit it for application to many purposes for which plain chromium stainless steels are unsuitable or less suitable.

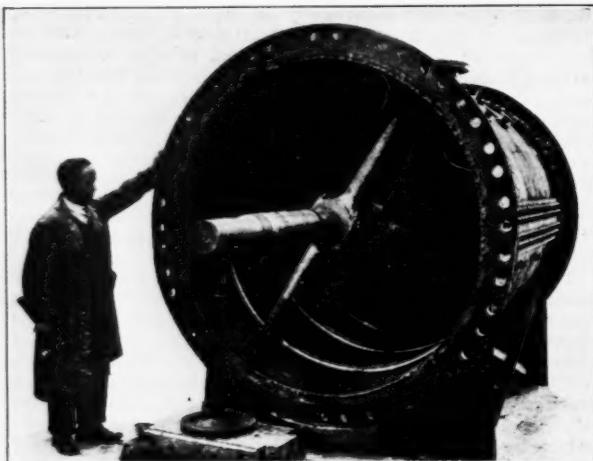
An entire chapter of the monograph is devoted to the effect of acids upon "Staybrite" steel. One of the most remarkable properties of the steel is its resistance to nitric acid of all concentrations and at all temperatures. It is also highly resistant to mixtures of sulphuric and nitric acid, and hence finds considerable application in "mixed" acid plants. The steel may also be used with acetic acid of all concentrations at temperatures up to boiling point (though it is attacked by the vapour of the 100 per cent. acid), and with many other acids, for details regarding which the monograph should be consulted.

### The "Tant" Alloys

Tantiron, the first acid-resisting iron to be put on the market, has been manufactured at the works of the Lennox Foundry Co., Ltd., of Tantiron Foundry, Glenville Grove, New Cross, London, for the last 18 years, and they can thus claim to be the original makers of acid-resisting iron on a commercial scale. The factory covers  $1\frac{1}{4}$  acres and comprises two foundries, heavy and light machine shops, pattern and smiths' shops. There are also very up-to-date chemical and physical laboratories, fully equipped for the purpose of carrying out research and experimental work on a large scale. Several demonstration shops are also available, where complete chemical plant can be erected and tested, or new processes tried out on commercial lines. In addition to Tantiron, various other alloys such as Tantcopper, Tantnickel and Tantlead are manufactured, the whole range giving a very wide choice of materials which may be required to withstand the action of various acids and corrosive liquids. As well as making chemical plant, pumps, valves, fittings, etc., in the above alloys, the firm manufacture machinery for nearly all chemical processes, including plant for the synthetic production of most organic bodies.

### Homogeneous Lead Lining

Vessels lined with loose lead sheets, even if the latter are at certain points fastened to the shell, add considerably to the manufacturing cost of the article produced in these vessels, owing to the repeated repairs which are necessary.



A 10-TON MONEL METAL-LINED AUTOCLAVE

alkalies, is its retention of a high proportion of its steel-like strength at the high temperatures and pressures which are now becoming common in modern chemical technology. This combination of qualities, coupled with the ready workability of Monel metal, renders it of great interest to both chemists

The lead sheets develop creases and folds and form blisters; in time the lead begins to creep, fracture or tear, and if not observed the acid eats through the steel shell. K.K.K. homogeneous lead lining consists of compound sheets, made of steel and lead in such a manner that the lead can only be removed from the shell by a hammer and chisel. The two metals are for practical purposes uniform in structure, they are not affected by differences of temperature up to 230° C., and they can therefore be regarded as uniform or homogeneous. Up to now over 20,000 tons of K.K.K. homogeneous lead-tin-, nickel-, and silver-lined material have been supplied to various chemical works all over the world. Among the latest orders which have been received or despatched from the works are a homogeneously internally lead-lined pipe line of 4,000 ft. length for South America. K.K.K. lead-lining is marketed by F. Weinreb, of 16-17, Devonshire Square, London.

### Acid-Resisting Concrete

An acid-resisting concrete is obviously a material of great value, and such a material is Prodorite, a new form of concrete in which the binding material of ordinary concrete (Portland cement) is replaced by a special binder. Prodorite is an elastic solid with no plastic or semi-fluid properties. It is claimed to be acid-proof, damp-proof, durable, non-conductive, and non-slipping. It has been largely used on the Continent for the last few years for flooring, tanks, acid-proof linings, etc.

With regard to Prodorite floors, they are laid on ordinary foundations, such as rough concrete, and the material in this case consists of pre-cast slabs which are welded on the site by a special Prodorite compound having the same acid-resisting properties as the slabs themselves. The finished floor presents a fine solid appearance and has a non-slipping surface. These floors may be laid by sections, thus avoiding disorganisation of business, and five minutes after welding are ready to withstand any load up to 6,000 lb. to the square inch. This crushing strength has been proved in official tests of standard material. The construction of absolutely acid-proof flooring of special durability is but one among the many ways in which the installation of Prodorite is of value.

Acid storage tanks up to 550 gallons are put forward in one piece, and above this capacity a special patent lining is being marketed, which should prove of great interest to firms requiring a relatively cheap acid-proof lining in various processes where, up to the present, rather expensive and sometimes inefficient means have been resorted to. As a comparison, it may be pointed out that the cost of a special brick-lined Prodorite tank would come out about 20 per cent. cheaper than a pitch pine acid-tight tank of similar capacity. This saving, considered in conjunction with the other advantages, together with the longer life of Prodorite, should prove a great inducement for acid-troubled manufacturers to investigate this product thoroughly.

### Acid-Resisting Enamel-lined Plant

One of the most important methods of avoiding acid corrosion in plant is by having it lined with acid-resisting enamel. A large variety of chemical plant—autoclaves, boilers, condensers, digesters; evaporating, mixing, vacuum and steam-jacketed pans; stills, tanks, etc.—made of cast iron lined with acid-resisting enamel is produced by Cannon Iron Foundries, Ltd., of Deepfields, near Bilton, Staffs. Plant is made of all dimensions and for all requirements. There are, for example, the British standard steam-jacketed pans, lined with hard grey acid-resisting enamel, of capacity up to 200 gallons, made to the design and specifications prepared by the joint research committee of the Association of British Chemical Manufacturers and the British Chemical Plant Manufacturers' Association, approved and adopted by the British Engineering Standards Association. These British standard pans are designed to give a maximum of efficiency in respect of heating surface, working capacity and strength. On the other hand, there is the newly-designed "Kelvin" mixing digester or still (with steam jacket or oil bath), of working capacity 1 gallon. This has been introduced to meet the requirements of the works laboratory, or the research chemist, or where a small output only of a particular product is required.

The enamel lining is guaranteed free from lead, arsenic or other deleterious ingredients, so that the vessel may be used with confidence when purity of product is a desideratum.

### Acid-Resisting Enamelled Chemical Plant

The chemical plant produced by the well-known firm of enamelled ware manufacturers, J. Vögele and Co., is distributed in this country by the Premier Filterpress Co., Ltd., of Finsbury Pavement House, London. The plant is cast-iron, lined with highly acid-resistant enamel, and includes standard and special vessels, pans, tanks, evaporating pans, laboratory apparatus, autoclaves, stills, agitators, steam-superheaters, steam-jacketed vessels of various kinds (with and without special fittings, etc.), and is specifically designed to serve the chemical, food and allied technical industries. In addition to its acid resistance, the enamel used is heat-resistant (up to 450° C.) and free from poisons. Plant is supplied in sizes up to capacity 440 gallons. The company has a special department for the re-enamelling of vessels, this being often, in the case of cast-iron, both possible and economic.

### A New Acid-Resisting Enamel for Lining Plant

The Pragos Engineering Co., Ltd., of 351, Brixton Road, London, are supplying plant of all kinds lined with a new enamel ("Plus Ultra") brought on the market by the Gebler Werke, A.-G., Radebeul, near Dresden. For over half a century this firm has specialised in the manufacture of plant lined with acid-resisting enamel, and for many years experiments were carried out to overcome the great drawback of enamelled plant, *i.e.*, the brittleness of the enamel. Users of enamel plant know only too well how the enamel sometimes cracks when heat is applied quickly, because although the coefficient of expansion of the cast iron used in the construction of the plant is, or should be, the same as that of the enamel, the rate of expansion is different, and consequently stresses are set up in the enamel which easily lead to the formation of cracks. The new enamel is claimed to possess exceptional mechanical strength, and to withstand rapid temperature variations remarkably well. These additional properties are naturally of the utmost importance, as they prevent the formation of those very fine cracks which so soon lead to the premature destruction of the whole apparatus through acid being able to creep behind the enamel. The acid-resisting property of a good enamel leaves, say the makers, nothing to be desired. The secret of satisfactory plant lies entirely in the method of application of the enamel to the iron, and in the mechanical strength of the enamel. In these respects special claims are made for "Plus Ultra." Among the plant supplied are autoclaves, condensers, crystallisers, evaporators, pipes, stills, tanks, trays, etc.

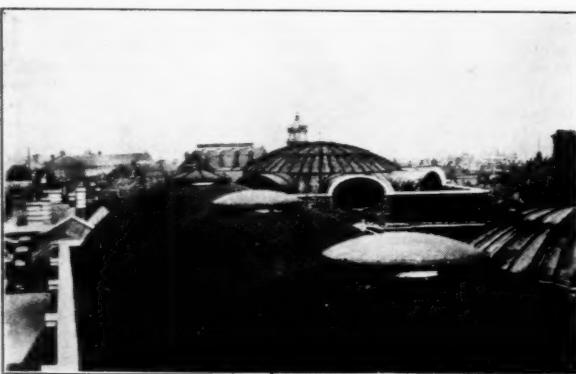
### Stabilised Bitumen

Bitumen is of great value as a protective agent, but it has one inherent weakness—its susceptibility to actinic rays, and its tendency under such action to coagulate, craze and finally to perish. For this reason efforts have been directed to the evolution of a process for retaining all the protective qualities of bitumen while preventing it from losing its ductility and from coagulating after application on any surface. D. Anderson and Son, Ltd., of 63, Fenchurch Street, London, state that their research department finds that the addition of a small percentage of a special protective colloid has a remarkable effect on the whole structure of bitumen. The addition of this protective colloid is said to disperse the gases which cause coagulation; the structure becomes consolidated; a higher degree of ductility is attained. Increased ductility ensures a more stable condition at high and low temperatures. This means greater durability, computed by some to give at least double the life of ordinary bitumen. The dielectric strength also becomes very high. As all ordinary bitumens can be stabilised in the first instance before use, this ensures that the standard of elasticity and durability of all protective work can be improved. This stabilised bitumen, which is marketed by the above company in various forms under the

name of "Stablex," is acid-resisting, and where such conditions are encountered the employment of the process for protective coating, etc., gives a greatly increased life and saves expensive reinstatement in all structures. "Stablex" has the property of remaining inert and constant while exposed to acid-saturated and other corrosive atmospheres. It is put forward as a coating suitable for the protection against corrosive agencies of constructional steelwork; pipe lines; corrugated iron and other metal surfaces; for coating pipe lagging; for waterproofing the surfaces of brick walls, stone walls, concrete flats; for coating leaking zinc, lead and asphalte flats; and for many other preservative purposes in every branch of industry. It is not influenced by high or low temperatures, which is an important property required of bitumen preparations. "Stablex" is supplied in a number of grades, in black and Tuscan red.

### A Corrosion-Resisting Medium

"Everseal" is a bitumastic liquid which can be applied cold, and which, state the makers, gives corrosion-resisting properties to all metals, also rendering any surface waterproof. Among other materials it contains high quality bitumen and long staple asbestos fibre, which give it the important quality of being impervious to sudden changes of temperature. As the temperature varies, so does the "Everseal" expand and contract with any surface it may cover. It resists acid fumes and alkalis. For these reasons special value is claimed for it for use on steel and iron structures as well as the waterproofing of roofs. The product is made in three consistencies—liquid, primer and plastic. The liquid form is suitable for application



"EVERSEAL" APPLIED TO A DOMED ROOF

to metals. The primer is specially made for use as a first coat on any very porous surface, such as asphalte, concrete, roofing felt, etc. It prepares the surface for the final coat of "Everseal" liquid. The plastic form is much heavier, and in treating asphalte, concrete, etc., it should be used to fill any large cracks which may have appeared. This also is usually done before the application of the liquid. "Everseal" can also be used, it is stated, on slated roofs with advantage, as not only does it make them waterproof, but it also bonds the slates together. "Everseal" is supplied by Everseal Products, Ltd., of Newton Works, Goldsmith Street, London.

### Resistant Bitumenised Felt

The problem of maintaining the roofs of large buildings in chemical works is a difficult one, owing to the action of chemicals, and especially acids, in the atmosphere. Whereas in many other industries large enclosed areas can be economically roofed with bitumen felt, in chemical works this method, though cheapest in first cost, has often been found most expensive in the long run, as the action of the polluted atmosphere necessitates repeated dressing and coating of the material, which, even with this precaution, has to be frequently renewed. The reason for this is that the body of the felts, being composed of wool, cotton or other rag fibres, has practically no resistance to this action other than that provided by the bitumen saturation. The Key Engineering Co., Ltd., of 4, Queen Victoria Street, E.C.4, state that their bitumenised

felt, made of long staple fibre, is not attacked by the polluted (acid or other) atmosphere, and remains sound without need of protective coatings and kindred maintenance. Incidentally, this mineral felt appears to be equally protective against sulphur and ammonia fumes. One of the principal railways, finding that the felted roofs of their locomotive sheds had a very short life owing to the sulphur fumes, experimented with this material, and found that the slightly increased first cost was soon paid for by the absence of maintenance charges. The engineers of a large gas company have lately carried out with success most rigorous tests, even to the extent of spraying the material with hot ammonia liquor.

### Bitumen Compound

In order that a bitumen compound used for coating iron may be efficient as a corrosion-preventing agent, it is necessary that the compound should have the same power of expansion and contraction as the surface it covers. Otherwise, owing to seasonal temperature changes, cracks develop, where corrosion commences. It is claimed by the Durastic Bituminous Paint Co., Ltd., of 1, Central Buildings, Westminster, London, that "Durastic," their bituminous preparation (composed of high-grade bitumen freed from organic acids and reduced to the consistency of paint by solvents), has this important property. Furthermore, as it both insulates and renders waterproof the surface covered, the latter is protected from corrosion. It is stated that "Durastic" will stand weak solutions of sulphuric and hydrochloric acid.

### Ebonite for Chemical Plant

A very important new outlet in the use of ebonite or vulcanite is showing itself in the direction of the manufacture of artificial silk. David Moseley and Sons, Ltd., of Manchester, one of the oldest manufacturers in the country, state that they have in hand important orders for pumps, valves and piping for this rapidly increasing industry, and that they fully anticipate that the artificial silk trade will be for some time of increasing importance to ebonite manufacturers. They add that there is, of course, a constant demand for ebonite tubing of all sizes. They also make sparge boxes (for vinegar makers) completely of ebonite; taps, pumps, bends, angle pieces, and many other specialties too numerous to mention. Ebonite pumps which have been in constant work for over thirty years in the alkali and other chemical industries show the wonderful durability of ebonite when it is properly made and correctly designed for its purpose.

### Acid-Resistant Tower Fillings

"Propeller" tower-filling elements for Glover, Gay-Lussac and refractory towers have, state the manufacturers, light weight combined with great scrubbing power and free air space—an asset in packing any tower. This, together with the fact that the elements can be packed loose in railway wagons and dispatched to any railway station or siding in the United Kingdom in wagon loads under the lowest railway rates with a quite negligible loss in breakage during transit, will convey at once to those interested something of the nature of the material out of which they are manufactured. They are peculiarly suitable for overseas shipment where the cost of cases is essential. That this is widely appreciated is proved by the regular and increasing business from India, Africa, New Zealand, etc. The elements are manufactured by John Statham and Sons, of Windsor Bridge, Manchester.

### Perlit and Thyssen Emmel Iron

For some time the British Perlit Iron Co., of London, have been carrying on negotiations with Mr. Karl Emmel, the inventor of the Thyssen Emmel process, and we are informed that they have now acquired the British and Colonial patent rights in the Thyssen Emmel process, as covered by Patent No. 244,405 of 1924, which they propose to exploit in this country in conjunction with the Perlit iron process, by selling an inclusive licence to their licensees, both present and future. It is hoped as a result of this combination that the company will be in a position to enable all British engineering works and foundries to acquire a licence on the most reasonable terms for the manufacture of these qualities of grey cast iron, which are so much needed in relation to the production of high class engines and machinery of all descriptions.

## Research on Atmospheric Corrosion

### Dr. Vernon's Second Experimental Report to the Committee

The Faraday Society has just published the Second Experimental Report to the Atmospheric Corrosion Research Committee (British Non-Ferrous Metals Research Association) presented by Dr. W. H. J. Vernon (who carried out the work), together with an account of the discussion held on the subject by the Society on March 30 (pp. 204, 8s. 6d.). Below is published a summary of the more important points in the report.

THE report is concerned with the behaviour of typical metals and alloys on exposure to the atmosphere; it is divided into two parts, dealing respectively with "indoor" and "open-air" exposure tests, the former including associated laboratory experiments. It is shown that conclusions which hold good for a given set of conditions do not necessarily apply when those conditions are changed; this is exemplified by the influence of "impurities" in copper. Indoors, under conditions such that only tarnishing has to be considered, a given element exercises an effect which is either negligible, or in simple proportion to the amount of element present. Exposed to the open air however, the same element may exert an effect out of all proportion to its concentration. It would appear that protection against indoor tarnishing should be sought by methods other than modification of composition alone; promising results have been obtained in connection with the formation of protective surface films.

#### Indoor Exposure Tests and Laboratory Experiments

As regards copper, treatment with solutions containing nitric acid is without appreciable influence upon the behaviour of the metal during subsequent exposure. Solutions containing chromic acid, on the other hand, produce a considerable degree of immunity from tarnishing. The influence of the purity of the metal upon the rate of tarnishing appears to be negligible. The tarnishing of copper is initiated by atmospheric sulphur; the minimum concentration necessary for tarnishing, however, is extremely small (equivalent, approximately, to 1 volume of  $H_2S$  in 600 million volumes of air). Above this value tarnishing commences and proceeds at a rate proportional to the "reactive" sulphur content of the atmosphere.

It is concluded that sulphur tarnish films on copper consist essentially of isomorphous mixtures of oxide and sulphide. There is reason to believe that if the first oxide lattice is completed before sulphur atoms can impinge (in the form and in the concentration in which they commonly occur in the atmosphere) their subsequent entry in any appreciable amount is prevented, and hence tarnishing is inhibited.

#### Formation of Protective Films on Copper

Whilst at the ordinary temperature there are two alternative types of film possible, *i.e.*, the "tarnish film" and the "protective oxide film," according to the relative purity of the atmosphere, at higher temperatures the latter type is developed to the exclusion of the former. The evidence leads to the suggestion that the minimum thickness of film necessary for protection is such that the unit lattice of the oxide is completed for the whole of the surface. It has been found that close contact with smoke from cellulose produces a considerable degree of immunity from tarnishing on subsequent exposure.

#### Zinc

The linear relationship in the case of zinc between weight-increment and time, found in the earlier work, has been confirmed for relatively long periods of exposure. The linear relationship between weight-increment and time which characterises the oxidation of zinc at the ordinary temperature, leads to the conclusion that the resulting film must have a granular structure, through the interstices of which gaseous diffusion of the atmosphere takes place. Direct evidence of this has now been obtained by examination under the microscope.

#### Brass

In an atmosphere of low relative humidity, containing traces of sulphur compounds characteristic of winter-time town air, the attack on 60/40 brass is at first chiefly directed upon the alpha constituent, which tarnishes in a similar manner to copper. Subsequently (and more rapidly the greater the humidity) the beta constituent is attacked, but the film is no longer "continuous" and takes the form of isolated pits, giving rise to an apparently duplex structure. The film of

oxide produced at the ordinary temperature by exposure to a relatively pure atmosphere, while affording considerable protection to copper, has relatively little effect upon the tarnishing of either 70/30 or 60/40 brass. Films produced at higher temperatures, however, exert a greater protective influence. In the case of brass exposed to a relatively humid atmosphere, a considerable degree of protection may be obtained by treatment with lanoline, combined with heat-treatment at 100° C.

#### Comparison of Copper, Zinc, and Brass

Results from tests extending over approximately 3½ years may be summarised as follows, the materials in each case being arranged in ascending order of the total corrosion which they have undergone in several types of indoor atmospheres:

- A. Atmosphere of varying, but mainly low relative humidity.

(1) Copper, (2) 70/30 Brass, (3) 60/40 Brass, (4) Zinc.

The brasses tend to approach nearer to zinc with increasing time.

- B. Atmosphere of varying, but mainly high relative humidity.

(1) Copper, (2) Zinc, (3) 60/40 Brass, (4) 70/30 Brass.

- C. Domestic Kitchen.

(1) Copper, (2) Zinc, (3) 60/40 Brass, (4) 70/30 Brass.

The order is nominally the same as in B, but the attack on 70/30 brass is now very much greater than that on 60/40.

Analysis of corrosion products from specimens exposed in the domestic kitchen show that a certain amount of the attack is due to organic fatty acids; these appear to act preferentially upon zinc and give rise to their zinc salts in the corrosion products.

#### Aluminium and Lead

The formation of the primary film of oxide on aluminium in the very early stages of exposure has been followed by careful gravimetric measurements which have led to the recognition of a weight-increment curve of an essentially different type from any of those previously obtained. The type of curve suggests that adsorption may play an essential part in the mechanism of oxidation in the present instance.

The weight-increment curve of lead is of the same type as that of aluminium. As in the case of aluminium, the film is completely invisible. It has been found that in the presence of traces of vapours from drying paint freshly-cleaned lead undergoes rapid oxidation and, in a week or so, becomes deep blue in colour. (Of all the metals examined, the effect is peculiar to lead.) If, however, the metal has been exposed for a sufficient length of time to the uncontaminated atmosphere, it is immune from such attack, owing no doubt to the formation of a protective film of oxide.

#### Iron

In an ordinary room atmosphere of low relative humidity such as obtains under conditions of artificial heating, the process of rusting of iron is controlled entirely by suspended solid impurities in the atmosphere. Rusting may be stopped entirely either by filtering the air, or by screening the specimen behind a single thickness of muslin. During such time as the iron is exposed to an atmosphere screened from solid particles, it develops a protective film, in an analogous manner to other metals (*i.e.*, copper and lead). On subsequent (normal) exposure this film definitely resists attack for a time, but then breaks down at certain points.

In the presence of suspended solid particles as before, and if the relative humidity is sufficiently high, the rate of attack accelerates from the start, owing to the deposition of particles and concomitant precipitation of moisture. (Rusting may still be prevented by screening behind muslin.) Under conditions prevailing at the dew-point, rusting of the iron takes place in the absence of suspended solid particles.

All the above tests were made indoors or in the laboratory.

**Open-Air Exposure Tests**

Further tests, representing over four years' exposure, have been conducted upon various grades of copper, together with 70/30 brass, 60/40 brass, and zinc. The order of resistance to corrosion is given below, the figures indicating the approximate total corrosion, that of H.C. copper being taken as 100.

Copper with 0·45 per cent. arsenic .....	43
Copper with 2·5 per cent. nickel .....	61
Copper with 0·8 per cent. tin .....	76
Ordinary copper .....	81
H.C. copper .....	100
70/30 brass .....	140
Zinc .....	155
60/40 brass .....	227

In connection with the high resistance displayed by arsenical and nickel copper respectively, it was noted that within the first few days of exposure these materials, among the copper specimens, showed the most rapid loss of reflectivity.

**Reviews**

A TEXT-BOOK OF BIOLOGICAL CHEMISTRY. By James B. Sumner, Ph.D. New York: The Macmillan Co. Pp. 283. 15s.

Dr. Sumner's book calls for no particular notice, in that it presents in already familiar style the usual material that makes up a student's text-book of medical chemistry. The actual treatment of the chemistry of foods, of the processes of digestion and metabolism and of the composition of blood and urine is along conventional lines, but at the same time seems to lack balance in that too frequently stress is laid on unimportant points that are of the type that will be retained by the mind of the average student often to the exclusion of the facts that are of real significance. If Dr. Sumner ever has to examine a class of students that have been reared on this book he will be haunted by the frequent reappearance in their papers of such statements as that . . . L-aspartic acid is found to occur in the free state in the slime of sea snails (p. 94).

Apart from this I think it is to be regretted that authors of volumes of this type should designate them text-books of biochemistry. To do so strengthens the view already too widely held, especially in the United States, that biological chemistry concerns itself solely with the chemical changes occurring in the bodies of the higher animals. There is no single indication in this volume of the wide concept of biological chemistry that one would like to see established. As a class manual the volume will doubtless serve as many others have served.

J. C. DRUMMOND.

OLD CHEMISTRIES. By Edgar F. Smith. London: McGraw-Hill Publishing Co. Pp. 89. 12s. 6d.

Professor Smith is obviously a real book-lover. Ruminating on the many happy hours his books have given him, he has written the present attractive volume in order to "call attention to a few—a very few—of the ancient chemical volumes reposing in dignity on the shelves of my old bookcase." The books with which he deals range from a copy of Geber's *Alchemiae*, published at Nuremberg in 1545, to text-books published early in the nineteenth century. Although the author says that his real purpose at first was to give an account of chemical books used for instructional purposes in the infancy of the United States, this publication is of much wider interest; for many of the books are of direct British or European origin, or are derived from books of such origin. The contents of the volume are grouped under the names of the authors mentioned, and much interesting biographical and other information is interpolated. The professor's racy and entertaining style renders his account very readable, and many of the tit-bits of information which he gives cry aloud for quotation. Students of popular modern fiction will be interested in the reference to "Jean Beguin's *Tyrocinium Chymicum*—1643. A very popular text this must have been, for on the fly-leaf of my copy an unknown scholar wrote—*this book passed through no fewer than 53 editions*. A best-seller more than 280 years ago!" In the account of the first American edition of Joseph Black's *Lectures on the Elements of Chemistry* there is a very choice story of the French chemists,

who, having shown that the views of Lavoisier were on a firm experimental basis, "had a solemn meeting in Paris, in which Madame Lavoisier, in the habit of a priestess, burned on an altar Stahl's *Chemia dogmaticae et Experimentalis Fundamenta*, solemn music playing a Requiem." The views on chemistry of President Adams, writing to Dr. John Gorham in 1817, when the latter assumed the Erving Chair of Chemistry at Harvard, should be more widely known: "We are all Chymists from our cradles. All mankind are Chymists from their cradles to their graves. The Material Universe is a chymical experiment. Its author and conductor is now, ever was, and ever will be, the only perfect Chymist in the universe." A special feature of Professor Smith's book is provided by the illustrations, which are numerous, and include many excellent portraits: taking regard of this, and of the handsome way in which the book is printed and produced, the price cannot be regarded as high. A Chymist who cannot sit down by his fireside and enjoy this book thoroughly must be a very churlish fellow indeed.

F.

A HANDBOOK OF ORGANIC ANALYSIS: QUALITATIVE AND QUANTITATIVE. By H. T. Clarke, D.Sc., F.I.C. Fourth Edition. London: Edward Arnold & Co. Pp. 363. 8s. 6d.

This handy little volume appears in its fourth edition; sixteen years having elapsed since its first appearance. The first four chapters deal with the qualitative aspect of the subject, being headed respectively preliminary investigation; examination for radicles; separation of mixtures of organic compounds; and classified tables of common organic compounds. This portion of the book has, in view of the new reactions and compounds disclosed by the progress of organic chemistry, undergone thorough revision. This is especially true of the reference tables, which have been almost entirely rewritten, in order to take advantage of the new data appearing in recent literature: these useful tables form a valuable section of the book, and the amount of information contained in them may be inferred from the fact that they occupy 187 pages. The rest of the book is filled by chapters on the quantitative determination of constituent elements; the quantitative determination of radicles; and the determination of some physical properties. In view of the growing importance of micro-analysis, it might be advisable to include a short account of micro-methods in future editions.

F.

TABLES OF PHYSICAL AND CHEMICAL CONSTANTS. By G. W. C. Kaye, M.A., D.Sc., F.Inst.P., and T. H. Laby, M.A., Sc.D., F.Inst.P. Fifth Edition. Longmans, Green & Co. Pp. 161. 14s.

In this new edition of Kaye & Laby's well-known book a certain amount of new information has been added, for example, on isotopes, etc., and the tables have been brought up-to-date. The various sections of the book deal with general physics, astronomy, etc.; heat; sound; light; electricity; magnetism; rays, radioactivity, and gaseous ionisation; chemistry; and mathematical tables. A random examination reveals data on (among many other subjects) atomic weights; conversion factors of units; the volume calibration of vessels; densities; melting and boiling points; vapour pressures; thermochemistry; spectroscopy; optical rotations; conductivities; physical constants of inorganic and organic compounds; composition and properties of minerals; factors for gravimetric analysis; logarithms, etc. In these days of severe international competition it is gratifying to find that this British product keeps up its high standard of excellence.

C. A.

THE CHEMISTS' YEAR BOOK: 1927. Edited by Dr. F. W. Atack. Manchester: Sherratt and Hughes. Pp. 1179. 21s.

In this (the twelfth) edition of the Chemist's Year Book, apart from a general revision, the section on "Trade Names of Drugs" has been incorporated in the section on "Pharmaceutical Names of Synthetic Products," which has been completely revised. The sections on "Analyses of Portland Cement," "Agricultural Chemistry," and "Dairy Products" have also been revised. The handy size and style of printing, paper, etc., have enabled the editor to compress an enormous amount of information into very small compass.

## The New I.G. Process

### Destructive Hydrogenation of Carbonaceous Materials

THE agreement between the I.G. Farbenindustrie A.-G. and the Standard Oil Co. of New Jersey for the exploitation of a new process for the production of synthetic petrol which the I.G. has evolved, as reported in THE CHEMICAL AGE of August 13, forms the subject of an interesting note in the current copy of *Nature*. It is stated that this agreement relates solely to the American markets, and further negotiations may be expected with European countries in respect of the realisation of the patent rights concerned. Much speculation appears to have arisen as to the precise nature of the process in question, as only the most meagre information has been officially forthcoming. The few details provided in the recent reports are sufficient to identify it with reasonable certainty as that which forms the basis of a group of very recent patent applications emanating from the I.G.

This new process, described as the destructive hydrogenation of carbonaceous materials, appears to comprise nothing more than a development of the well-known Bergius method, according to which coal or similar material is subjected to thermal decomposition in the presence of hydrogen under pressure to produce hydrocarbon mixtures of the nature of petroleum. But whereas berginisation is essentially non-catalytic, the new process is based upon the discovery that the introduction of certain catalysts leads to the formation of more valuable hydrocarbons, with increased yields and at an enhanced rate.

### Use of Catalysts

The first of these catalysts to be protected by the I.G. were compounds of nitrogen, whether added as such or formed *in situ* from added nitrogen; then followed molybdenum and its compounds, then chemically combined sulphur, then tungsten and chromium, until now a whole host of such substances have been described. Furthermore, the hydrogen need not be so highly concentrated as in the berginisation method; it may even be present as combined hydrogen, e.g., as hydrogen sulphide or methane, or it may be produced by the introduction of steam, which reacts with the carbonaceous material. Otherwise, the reaction conditions appear to be very similar to those obtaining in the berginisation method. Like the latter, it is applicable not only to coal and other solid materials, but also to the treatment of tars, mineral oils, or their distillates, and even to such bodies as asphalts and resins. Presumably it is in the treatment of heavy oil distillates and residues that the Standard Oil Company is interested, for any process using coal as starting material could scarcely be an economic proposition for some years to come in the United States, considering its natural oil resources.

It may be remarked that the engineering difficulties associated with the treatment of large quantities of materials under the high temperatures and pressures proposed (of the order of 500° C. and 200 atmospheres) are very considerable, even to an organisation like the I.G., which has unparalleled experience of the technique of high-pressure working. Any estimation of the commercial importance of the process must therefore be reserved until it has definitely emerged from the experimental stage and more detailed information is available concerning it.

### German Celluloid Production

Of an estimated world production of 40,000 tons of celluloid annually, Germany is said to produce between 10,000 and 15,000 tons. Of German production the I.G. produces one half, or from 5,000 to 8,000 tons. The I.G. production is accounted for by Koeln-Rottweil A.-G., which was merged with the I.G. in 1926, a merger that involved close community of interest with Rottweil's associated Rheinisch-Westfälische Sprengstoff A.-G., Cologne, and the Deutsche Celluloid Fabrik in Eilenberg. Deutsche Celluloid produces nitro-cellulose of all kinds, raw celluloid in different forms, film raw material, and celluloid articles. Germany's exports of celluloid amount to 2,500 to 3,000 tons annually. Camphor entering local celluloid production is manufactured synthetically chiefly by one firm in Berlin, controlling Rheinische Kampfer Fabrik of Dusseldorf. More recently, the I.G. is reported to have taken up manufacture of synthetic camphor.

## "C.A." Queries

We receive so many inquiries from readers as to technical, industrial, and other points, that we have decided to make a selection for publication. In cases where the answers are of general interest, they will be published; in others, the answers will simply be passed on to the inquirers. Readers are invited to supply information on the subjects of the queries:—

70. ("Planters Cleaner.")—"We should be glad if you could put us into touch with anyone who handles 'Planters Cleaner.' We understand that this material is manufactured in America and is largely used for cleaning steel and brass."

71. (Research Chemicals).—"We should be grateful if you could give us the names of manufacturers or merchants able to supply small quantities of the following research chemicals:—Potassium ethyl xanthate, thiocarbonalide, trioxanthraquinone, mononitrate of phenanthraquinone, nitro alizarine, anthranole, nitro-anthraquinone-nitrate, sodium bi-nitrite(?), beta-naphtho-quinone."

### The I.G. and the Lilienroth Process

PHOSPHORUS production by the F. G. Lilienroth electric furnace operating at Piesteritz (Central German Nitrogen Works) will amount to 70 tons of phosphorus daily. The output is transported to Wolfen bei Bitterfeld, where it is oxidised to phosphoric acid. Combined with Leunawerke ammonia to diammoniumphosphate at a production cost (according to *Die Metallbörse*) of 25 to 30 pfennigs per kilo. It will be further processed at Leuna to "Nitrophoska," the new fertiliser. German patents covering the Lilienroth furnace operations are Nos. 406,411 and 409,344. The oxidation process is characterised by burning yellow phosphorus vapours (catalytically) at 1,000° C. in presence of water vapour, recovering hydrogen thereby for the ammonia synthesis. Having acquired a licence to operate the process at Piesteritz, the I.G. Farbenindustrie A.-G. has conceived further extensions on it, which are covered by German patent Nos. 408,925; 423,275; 426,388; 431,504; 435,387; and 438,178.

### The Fleet Street Tours

THE tours of Old London arranged by THE CHEMICAL AGE and conducted by Mr. Allen S. Walker, will recommence in September, the remaining tours being as follows:—Wednesday, September 7, St. Paul's Cathedral, etc.; Tuesday, September 13, Stationers' Hall, remains of London Wall etc.; Wednesday, September 21, St. Andrew's-by-the-Wardrobe and the site of Shakespeare's Blackfriars Theatre; September 27, Staple Inn, Furnival's Inn, the old houses in Holborn, and "Dicksenland." The tours commence from Bouvierie House at 2.45 p.m. Readers of THE CHEMICAL AGE who desire to attend should make application for tickets to the Editor, Bouvierie House, 154, Fleet Street, E.C.4.

### Vacant Appointments

A Lectureship in Biochemistry (Grade I) in the Physiological Department, University of Birmingham. £600. The Secretary, September 21.

A Drapers' Company's Research Scholarship in Dyeing (£100 per annum); a Joseph Blamires Research Scholarship (£100 per annum) and a British Dyes Research Scholarship (£75 per annum), both for research in colour chemistry. The Director of Education, The Technical College, Huddersfield.

A Research Assistant for Soil Survey Work in the Department of Agriculture, University College of North Wales, Bangor. Degree in chemistry essential. £200. The Secretary and Registrar, September 10.

A Part-time Teacher of Chemistry at the Technical School, Southport. The Director of Education, Southport.

An Assistant for the collation of records in the Records Department of the Department of Scientific and Industrial Research, £200-£250. The Secretary, 16, Old Queen Street, Westminster, London, September 12.

## From Week to Week

SIR E. A. BROTHERTON, Bart., on Thursday, August 18, laid the foundation-stone of a parochial hall for Roundhay, Leeds.

MR. EDWARD WILLIAMS, of Trevor, has just completed fifty years of service at Cefn Chemical Works, where he is manager. He began as a labourer.

FATAL INDUSTRIAL ACCIDENTS reported during July included four in chemicals, etc. manufacture, and two in the textile bleaching and dyeing industry.

RECENT WILLS INCLUDE: Mr. Frank Lloyd, chairman and governing director of Edward Lloyd, Ltd., paper makers, £679,923 (net personality, £618,052).

THE ERECTION OF UNIVERSITY COLLEGE, HULL, is to commence at once. The Board of Education has approved the plans for the first instalment of the College building, which will be erected on the Nottingham Road.

THE AMERICAN VISITORS TO ENGLAND at present include Professor Hugh S. Taylor, of Princeton University, who has been making a tour of Europe and who intends to stay over the meetings of the British Association at Leeds.

THREE OF THE TRADE UNIONS concerned with the chemical and drug trade—the Drug and Chemical Workers' Union, the National Union of Cokemen and By-Products Works, and the Salt and Alkali Workers' Federation—are, it is believed, negotiating for a fusion of interests.

AT AN INQUEST held at Wells, on Tuesday, August 16, on Frederick James Burgess, leading fireman at the chemical works of the Gas Light and Coke Co. at Beckton, who died on the previous Sunday, the coroner recorded a verdict "that the deceased died suddenly from apoplexy."

THE CHINA CLAY PRODUCERS concerned in the formation of the new "all-in" association are believed to have agreed, at the private meeting held in St. Austell last week which decided on the formation of the association, to take the necessary steps for the completion of the arrangements by the end of this month.

THE BOARD OF TRADE COMMITTEE'S report on the dating and sealing of patents is now available. The committee do not favour a change in existing practice, but recommend that, if a change is considered necessary, it should be limited to an alteration in the term of the patent, so that the fixed portion of the monopoly period should run from the filing of the complete specification.

THE NUMBER OF UNEMPLOYED INSURED PERSONS at July 25 in Great Britain in chemicals manufacture was males 5,023, females 789, total 5,812; in explosives manufacture, males 916, females 362, total 1,278; in paint, varnish, japan, red and white lead manufacture, males 570, females 139, total 709; in oil, grease, glue, soap, ink, match, etc., manufacture, males 4,566, females 835, total 5,401.

THE PERCENTAGE OF INSURED WORKERS unemployed in Great Britain and Northern Ireland in chemicals manufacture at July 25 was 6·3, a decrease of 2·6 per cent. on July 27, 1926; in explosives manufacture, 6·9, an increase of 0·2 per cent.; in paint, varnish, japan, red and white lead manufacture, 4·1, a decrease of 0·6 per cent.; in oil, grease, glue, soap, ink, match, etc., manufacture, 6·8, a decrease of 1·4 per cent.

REPORTS HAVE BEEN PUBLISHED of the acquisition of control of Vickers Boiler Co. (a private concern and a subsidiary of Vickers) by Babcock and Wilcox, Ltd. The latter have a capital of £4,578,712, and last year, despite labour troubles, net profits amounted to £716,577, or only £69,000 below those of the preceding year. The ordinary dividend was 15 per cent., as for the previous year, and by allocating £150,000 to reserve that fund was brought up to £702,000.

A FUSION will, it is believed, take place in Germany between Karau's Farben und Oelwerke A.-G., Dusseldorf, and Heyl-Beringer, of Berlin, manufacturers of mineral colours, a combination formed in August, 1926. As the intended merger plans to enlist other mineral colour establishments in a larger merger, the consolidation gains significance. It is further stated that Heyl-Beringer will raise its capital from 1,000,000 to 15,000,000 or 18,000,000 marks for fusion purposes. Heyl-Beringer has an understanding with the I. G. on cadmium colours.

AN EXPLOSION on the premises of M. Riley and Sons, firework manufacturers, of Ossett, Yorkshire, on Friday, August 19, resulted in the death of the proprietor, A. V. S. Riley, and two workmen, F. Ward and F. Bottomley. At the inquest on Tuesday, it was stated that the men were mixing flash composition, consisting of potassium chlorate, aluminium, and an arsenic derivative. Colonel Thomas (Explosives Inspector, Home Office) said the mixing should not have been done at the place chosen, there being special screened sheds licensed for the purpose. The firm had an excellent character at the Home Office, and were always ready to carry out instructions for the safety of the workmen. A verdict of "Death from misadventure" was returned.

THE EMPIRE MINING AND METALLURGICAL CONGRESS has been invited to hold its next meeting in South Africa in 1930.

EXPORTS OF PYRITES from Cyprus in 1926 amounted to 150,000 tons. The production of asbestos was 6,500 tons, compared with 2,000 tons in 1923.

A SMALL FACTORY HAS BEEN ERECTED at Frankfurt for the production of alcohol from glucose by the "Classen" process of treating waste cellulose materials.

THE SWEDISH MATCH TRUST is stated to have offered to take over the Estonian match monopoly, guaranteeing the Government a yearly income of 60 million Estonian marks.

MR. HAROLD MOORE, M.Sc.Tech., consulting and analytical chemist, London, has been appointed consultant chemist to the National Lubricating Oil and Grease Federation.

PROFESSOR H. FREUNDLICH, of Berlin, Professor R. A. Millikan, of Pasadena, California, and Professor P. Debye, of Zurich, will be among the foreign guests attending the British Association meeting at Leeds.

CHEMICALS IMPORTED INTO CANADA from the United Kingdom during the year ended March 31, 1927, were valued at 4,906,256 dollars (as compared with 4,282,480 dollars in the previous year). Exports from Canada to the United Kingdom amounted to 3,567,256 dollars (as compared with 3,318,614 dollars).

A PROPOSAL FOR THE ESTABLISHMENT OF A PLANT to convert waste sawmill products into high grade charcoal for briquette fuel and poultry feed is being considered by the Board of Trade, Westminster, British Columbia. A feature of the plant, which would cost from \$15,000 to \$100,000, is the elimination of smoke.

INDIGO EXPORTS from India during June totalled 139 cwt., as compared with 154 cwt. in June, 1926; 37 cwt. went to Persia and Mesopotamia, and 102 cwt. to other countries. The total exports in the period January-June inclusive amounted to 887 cwt., as compared with 1,258 cwt. in the corresponding period of 1926.

THE PUBLIC EXAMINATION of George Douglas Spencer, a dyer's chemist, of New Road Side, Rawdon, was held at the Leeds Bankruptcy Court on August 16. Gross liabilities were stated at £300 and deficiency as £284 12s. 8d. The cause of his failure was stated to be judgment and costs in a legal action. The examination was adjourned until October 4.

MR. HARRY THOMAS, of Haworth, has been awarded a research scholarship tenable at Oxford University by the Extra Mural Committee of the University of Oxford. He will go into residence at Queen's College. While attending Huddersfield Technical College as an adult student, Mr. Thomas was awarded a Cassell Scholarship for Manchester University. He is a member of the Haworth Urban Council.

THE LATEST PUBLICATION ON FUEL RESEARCH issued by the Department of Scientific and Industrial Research is "The Lancashire Coalfield: The Ravine Seam, Part II: Carbonisation in Continuous Vertical Retorts," being No. 9 of the monographs on the physical and chemical survey of the national coal resources (H.M. Stationery Office, pp. 34, 1s. 6d.). It gives the results of a sequence of large-scale tests carried out at H.M. Fuel Research Station. The information obtained on gas-making qualities of the coal has been supplemented by carrying out experiments to determine the value of the coal and the coke for steam-raising purposes, and also the suitability of the coke for water-gas and suction-gas production. The results obtained show the Ravine coal and coke to be well suited, as regards yield, etc., for the purposes for which they were tested.

### Obituary

PROFESSOR HENRY RICHARDSON PROCTER, F.R.S., formerly head of the Leather Industries Department of the University of Leeds, at Newlyn, Cornwall, aged 79. An account of his life and work appears on another page.

PROFESSOR JOHN ROBINSON LEEBODY, M.A., D.Sc., F.I.C., president of the McCree-Magee Presbyterian College and public analyst for Londonderry, at Londonderry, on Sunday, August 21, aged 88. He was elected a Fellow of the Institute of Chemistry in 1878.

MR. T. A. SALISBURY JONES, of White House, Dover, who was killed in the train-wreck which occurred at Sevenoaks on Wednesday evening. Mr. Salisbury Jones was the brother of Mr. F. W. Salisbury Jones, well known in connection with the low-temperature carbonisation of coal.

PROFESSOR B. B. BOLTWOOD, who had occupied the chair of chemistry at Yale University for the last 17 years, on Tuesday, August 16, aged 57. He was found dead with a bullet in his brain and a rifle at his side, in the house of friend with whom he had been staying at Hancock Point, Maine. He had been in ill-health for some time. Professor Boltwood had done valuable work in the field of radio-activity research, one of his achievements being the discovery of a new element, ionium. He worked for a time in association with Sir Ernest Rutherford.

## References to Current Literature

### British

**ANALYSIS.**—The natural occurrence of boron compounds in cacao and cacao products. A. S. Dodd. *Analyst*, August, pp. 459-466.

Cacao butter substitutes and their detection. A. W. Knapp, J. E. Moss, and A. Melley. *Analyst*, August, pp. 452-456.

The separation of vanadium from tungsten. S. G. Clarke. *Analyst*, August, pp. 466-469.

A simple mercury cathode for arsenic determinations. F. S. Aumonier. *J.S.C.I.*, August 12, pp. 341-345T.

**APPARATUS.**—A simple colorimeter. R. C. Frederick. *Analyst*, August, pp. 469-470.

**COAL.**—The carbonisation of particles of coal. The study of cenospheres. V. F. S. Sinnatt, A. McCulloch, and H. E. Newall. *J.S.C.I.*, August 12, pp. 331-335T.

**DYE FASTNESS.**—Reports of research work on the fastness to light of dyestuffs on woollen and worsted fabrics. I. A comparison of the fading of dyestuffs in tropical and in English sunlight and in artificial light. S. G. Barker and H. R. Hirst. II. Atmospheric humidity and the fading of dyestuffs. J. J. Hedges. III. Relation between time of exposure and loss of colour due to fading. S. G. Barker, H. R. Hirst, and P. N. Lambert. IV. Relation between initial depth of shade and loss of colour due to fading. S. G. Barker, H. R. Hirst, and P. N. Lambert. *J. Soc. Dyers and Col.*, August, pp. 253-266.

A method of detecting complete development of Indigosols and Soledon colours on wool. H. R. Hirst and P. E. King. *J. Soc. Dyers and Col.*, August, pp. 266-267.

**DYESTUFFS.**—The electrolytic reduction of vat dyes. F. Bryans and F. M. Rowe. *J.S.C.I.*, August 12, pp. 335-338T.

**GENERAL.**—The relation of the cystine yield to the total sulphur in wool. J. Barritt. *J.S.C.I.*, August 12, pp. 338-341T.

The inter-relationships of the sulphur acids. H. Bassett and R. G. Durrant. *J. Chem. Soc.*, July, pp. 1401-1468.

**ORGANIC.**—Monothioethylene glycol. III. Nitrophenyl thioethers. G. M. Bennett and W. A. Berry. *J. Chem. Soc.*, July, pp. 1666-1676.

Experiments on the synthesis of anthocyanins. III. A. Robertson and R. Robinson. *J. Chem. Soc.*, July, pp. 1710-1717.

The Reimer-Tiemann reaction with *m*-chlorophenol. H. H. Hodgson and T. A. Jenkinson. *J. Chem. Soc.*, July, pp. 1740-1742.

### United States

**ADSORPTION.**—Effect of  $p_H$  on adsorption by carbons. S. M. Hauge and J. J. Willaman. *Ind. Eng. Chem.*, August 1, pp. 943-953.

**ANALYSIS.**—Thioglycollic acid as a colour test for iron. E. Lyons. *J. Amer. Chem. Soc.*, August, pp. 1916-1920. Confirmatory test for aluminium. W. J. Allardye. *J. Amer. Chem. Soc.*, August, p. 1991.

**APPARATUS.**—A new absolute manometer for low pressures. W. H. Rodesbush and C. C. Coons. *J. Amer. Chem. Soc.*, August, pp. 1953-1955.

**GENERAL.**—The rôle of water in the photochemical decomposition of zinc sulphide. H. B. Weiser and A. D. Garrison. *J. Phys. Chem.*, August, pp. 1237-1245.

The purification of thermo-regulators. G. D. Beal and B. L. Souther. *J. Amer. Chem. Soc.*, August, p. 1994.

Crystallisation of paraffin wax. F. H. Rhodes, C. W. Mason, and W. R. Sutton. *Ind. Eng. Chem.*, August 1, pp. 935-938.

The decomposition of hydrogen sulphide. H. A. Taylor and C. F. Pickett. *J. Phys. Chem.*, August, pp. 1212-1219.

The creeping of solutions. E. R. Washburn. *J. Phys. Chem.*, August, pp. 1246-1248.

**ORGANIC.**—Silicon tetrachloride as a reagent for the preparation of acid chlorides. R. E. Montonna. *J. Amer. Chem. Soc.*, August, pp. 2114-2116.

Catalytic oxidations in aqueous solutions. I. The oxidation of furfural. N. A. Milas. *J. Amer. Chem. Soc.*, August, pp. 2005-2011.

Preparation and properties of diethyleneglycol dinitrate. W. H. Rinkenbach. *Ind. Eng. Chem.*, August 1, pp. 925-927.

**PLANT.**—The place of the Diesel engine in chemical industry. E. J. Kates. *Ind. Eng. Chem.*, August 1, pp. 874-878. Collapsing strength of thin tubes and pipes in chemical plant. W. F. Schaphorst. *Ind. Eng. Chem.*, August 1, p. 887.

### German

**ANALYSIS.**—The qualitative detection of chromium by oxidation with bromine or iodine in the presence of silver nitrate. E. Posner. *Z. anorg. u. allg. Chem.*, August 5, pp. 407-508.

The determination of the softening point of pitch and asphalt according to G. Kraemer and C. Sarnow. *Z. angewandte Chem.*, August 11, pp. 927-928.

The analysis of fluorspar. Brauer and Ruthsatz. *Chem.-Zeit.*, August 13, pp. 618-619.

The applicability of the determination of sulphuric acid by the aid of benzidine in water analysis. L. W. Haase. *Chem.-Zeit.*, August 20, pp. 637-638.

**COLLOIDS.**—The preparation of uniform silver hydrosols free from protective colloids. I. J. Voigt and J. Heumann. *Z. anorg. u. allg. Chem.*, August 5, pp. 409-419.

The cataphoretic mobility of the coarser particles in sols and gels. H. Freundlich and H. A. Abramson. *Z. physik. Chem.*, August, pp. 25-38.

Technical aerosols and their characteristics. P. Beyersdorfer. *Kolloid-Z.*, July, pp. 229-233.

Silica gel and its adsorptive power. P. Mautner. *Kolloid-Z.*, July, pp. 273-275.

**GENERAL.**—Intramolecular rearrangements in the complex-compounds of cobalt. A. Uspensky and K. Tschibisoff. *Z. anorg. u. allg. Chem.*, August 5, pp. 326-334.

The investigation of some substitution reactions in the inner sphere of complex compounds. *Ibid.*, pp. 335-340. Base exchange in permutes. G. Wiegner and H. Jenny. *Kolloid-Z.*, July, pp. 268-272.

The application of trichloroethylene as a solvent in fat determinations. J. Grosfeld. *Chem.-Zeit.*, August 13, pp. 617-618.

**RUBBER.**—Rubber-filler systems. A contribution to the colloid problems of the rubber industry. P. Stamberger. *Kolloid-Z.*, July, pp. 295-300.

**STEREOCHEMISTRY.**—The stereochemistry of tervalent nitrogen and of N-heterocyclic compounds. L. Orthner. *Annalen*, August 5, pp. 225-252.

### Miscellaneous

**GENERAL.**—Influence of adsorbent substances on chemical equilibrium in solution. R. Dubrisay and J. Bravard. *Comptes Rendus*, August 8, pp. 385-386 (in French).

Waste Kauri wood as a source of paper pulp and resin. *New Zealand J. Sci. and Tech.*, May, pp. 4-10.

Stearic acid as a rubber compounding ingredient. W. B. Wiegand. *Canadian Chem. Met.*, August, pp. 211-212.

Evaporation of sulphite waste liquor. W. L. Badger. *Canadian Chem. Met.*, August, pp. 205-207.

On some physical properties of nitrophenols. L. Desvergne. *Rev. Chim. Ind.*, June, pp. 194-196; July, pp. 224-226.

On some salicylates and citrates of bismuth. P. Godfrin. *J. Pharm. Chim.*, July 16, pp. 49-62 (in French).

A new method for the transformation of alkali chlorides into nitrates with simultaneous production of chlorine. V. Dominik. *Chim. et Ind.*, July, pp. 24-32 (in French).

## Patent Literature

The following information is prepared from published Patent Specifications and from the Illustrated Official Journal (Patents) by permission of the Controller to H.M. Stationery Office. Printed copies of full Patent Specifications accepted may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

### Abstracts of Complete Specifications

273,660. PURE LEAD CARBONATE FROM CRUDE LEAD SULPHATE. MANUFACTURE OF. R. Daloze, 5, Avenue de Longchamp, Brussels, Belgium. International Convention date, July 3, 1926.

This process depends upon the reaction between lead sulphate and an alkaline earth acetate. A mixture containing three equivalent parts of calcium acetate and one equivalent part of lead acetate is caused to act upon two equivalent parts of lead sulphate. Calcium sulphate is precipitated, and the excess of calcium acetate present prevents the reaction from being reversed. The solution is treated with milk of lime in the proportion of two equivalent parts of calcium acetate to three equivalent parts of lead acetate. Two equivalent parts of lead are precipitated and redissolved into tribasic acetate by combining with the lead acetate in solution. The calcium acetate of the initial solution is recovered. The liquid is filtered and the solution treated with carbon dioxide to precipitate lead carbonate, which is filtered off. The mixed solution of lead acetate and calcium acetate is used again for dissolving crude lead sulphate.

273,622 and 273,810. OXYGEN-CONTAINING ALIPHATIC COMPOUNDS, PRODUCTION OF. H. Dreyfus, 8, Waterloo Place, London, S.W.1. Application date, June 26, 1925.

273,622. Keten is obtained by heating acetaldehyde vapour to a temperature of 150°-300° C. at atmospheric pressure, or at higher temperatures and pressures, in the presence of catalysts such as nickel, copper, zinc. The acetaldehyde may be removed by condensing, and the keten collected as a gas. The keten may be used to form concentrated acetic acid or anhydride by absorbing in water or acetic acid, the nature of the products depending on the amount of water. The invention may be modified by subjecting a mixture of water vapour or acetic acid vapour and acetaldehyde vapour to heat in the presence of a catalyst, the product being a mixture of acetic acid, acetic anhydride, and keten, the latter being then decomposed by the water.

273,810. Dilute acetic acid, especially waste acid from the manufacture of cellulose acetate is vapourised and passed with hydrogen over reduction-promoting catalysts such as nickel, iron, zinc, tin, lead, silver, platinum, palladium, copper, pumice, glass wool, or sodium chloride, at a temperature of 100°-400° C. Acetaldehyde is formed, and is separated by fractional condensation. It may be converted into glacial acetic acid by oxidation.

274,156. DYES. H. A. E. Drescher, J. E. G. Harris, B. Wylam, J. Thomas, and Scottish Dyes, Ltd., Earl's Road, Grangemouth, Scotland. Application date, March 15, 1926.

This process comprises the reaction between a quaternary ammonium halide which may be obtained by treating a tertiary organic base and an alkyl halide, in tertiary organic base suspension, with a metal, a vat dyestuff, and a product obtained by the interaction of a tertiary organic base with a reagent such as an alkyl chlor-sulphonate, chlorsulphonic acid, oleum, or sulphur trioxide. Examples are given of the treatment of indigo, methyl pyridinium iodide, zinc and pyridine with the mixture obtained by adding methyl chlor sulphonate to pyridine, dimethoxy-dibenzanthrone, methyl chloride, zinc and pyridine with pyridine sulphur trioxide, and several others. The articles to be dyed are immersed in the solution and then treated with an oxidising bath.

274,175. N-MONOALKYL-*p*-AMINOPHENOL, PROCESS FOR THE MANUFACTURE OF. H. E. Potts, Liverpool. From Chemische Fabrik Grünau Landshoff and Meyer Akt.-Ges., Grünau bei, Cöpenickerstrasse 10, Berlin. Application date, April 10, 1926.

It has been found that *N*-monoalkyl-*p*-aminophenols can be obtained from *O*-alkyl-*N*-alkyl-acidyl-*p*-aminophenols by effecting the hydrolysis with the aid of sulphuric acid. Sulphonation does not take place if the temperature, time,

strength, and amount of acid are kept between the limits of 3 equivalents of 70 per cent. acid for 4½ hours at 146° C. and 6 equivalents of 50 per cent. acid for 3 hours at 139° C.

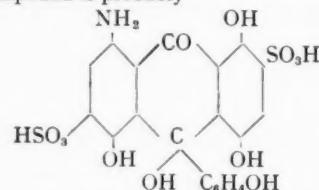
274,197-8. SOLID SODIUM HYPOCHLORITE PREPARATIONS, MANUFACTURE OF. M. P. Applebey, 41, Museum Road, Oxford, and C. Carter, St. John's College, Oxford. Application date, April 16, 1926.

274,197. Solid and dry sodium hypochlorite preparations are obtained by treating a strong solution, or melted crystals, with anhydrous or partly dehydrated soluble salts of alkaline character which are capable of forming stable hydrates, or reacting with the hypochlorite to produce sodium salts which will form stable hydrates. Sodium metaborate is suitable, and also partly or wholly dehydrated tribasic potassium phosphate.

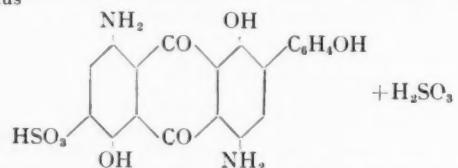
274,198. In this case the substance added to the sodium hypochlorite is wholly or partly dehydrated tri-sodium phosphate. The product may contain 26-27 per cent. of available chlorine.

274,211. NEW ANTHRAQUINONE DERIVATIVES, PROCESS FOR THE MANUFACTURE OF. W. Carpmael, London. From I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. Application date, April 19, 1926.

These new derivatives are obtained by treating the boric acid ester of *p*-diamino-anthrarufin-2 : 6-disulphonic acid or an *N*-methyl derivative with an equimolecular quantity or excess of an oxy compound of the aromatic series as such or in the form of its ether in concentrated sulphuric acid solution. The products appear to be due to the addition of one molecule of the phenol, naphthol, or anisol on one of the ketonic groups. The phenol compound is probably



These products may be treated with dilute acid or alkali which eliminates one of the sulpho groups and replaces it by the phenol radical from the product of addition, while the hydrogen atom attached to the phenol residue is eliminated together with the sulpho group in the form of sulphurous acid, thus



The remaining sulpho group can also be split off to obtain new derivatives applicable as mordant dyestuffs. Several examples are given.

274,226. INDANTHRENE DISULPHONIC ACIDS AND INDANTHRENE. British Dyestuffs Corporation, Ltd., 70, Spring Gardens, Manchester, A. Shepherdson and A. J. Hailwood, Crumpsall Vale Chemical Works, Blackley, Manchester. Application date, April 26, 1926.

*1*-Nitroanthraquinone-8-sulphonic acid is reduced in neutral or alkaline solution yielding probably *1*-hydroxylamino-anthraquinone-8-sulphonic acid which is converted on boiling with caustic alkali into indanthrene-disulphonic acid. The removal of the sulphonic acid groups may then be effected by electrolytic reduction in a divided cell. Examples of the reduction are given, employing sodium sulphide, zinc dust, or glucose, followed by desulphonation of the indanthrene-disulphonic acid.

274,259. ALKYLENE DIGUANIDINES. M. Heyn, 15. Hobrechtfuer, Breslau, Germany. Application date, June 18, 1926. Addition to 272,686.

Specification 272,686 (see THE CHEMICAL AGE, Vol. XVII, p. 114) describes the production of amino-guanidines and amino-alkylene-guanidines from aliphatic diamines or their hydrates. It is now found that the same method will produce alkylene diguanidines. Salts of the alkyl-isothioureas are heated with the alkylene diamines higher than pentamethylene diamines.

274,263. AMMONIUM CHLORIDE, MANUFACTURE OF. J. W. Moore, Kinderton House, Weston Road, Runcorn, Cheshire, W. G. Polack, Glamis House, Chapel Lane, Frodsham, Cheshire, and Castner-Kellner Alkali Co., Ltd., Weston Point, Runcorn, Cheshire. Application date, June 25, 1926.

A mixture of hydrochloric acid with 30 per cent. of hydrogen is obtained by burning chlorine in excess of hydrogen, and combined with gaseous synthetic ammonia. The remaining hydrogen is used for the manufacture of synthetic ammonia or hydrochloric acid.

274,303. DYES. B. Wylam, Carr House, Regent Street, Lancaster, J. E. G. Harris, Murrell Hill House, Carlisle, J. Thomas and Scottish Dyes, Ltd., Murrell Hill Works, Carlisle. Application date, March 1, 1926.

A reddish flavanthrone derivative is obtained by the treatment of leuco flavanthrone with chlorsulphonic acid in the presence of a tertiary base at a temperature above 45° C., the tertiary base being in at least equimolecular quantity to the chlorsulphonic acid. The product may be mixed with weak ammonia to precipitate the reddish derivative.

274,366. 1-PHENYL-3-METHYL-5-PYRAZOLONE, MANUFACTURE OF. O. Y. Imray, London. From I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. Application date, February 5, 1927.

1-Phenyl-3-methyl-5-pyrazolidone in aqueous acid solution is oxidised with air or oxygen in the presence of a salt of a heavy metal such as ferric chloride and copper chloride to obtain 1-phenyl-3-methyl-pyrazolone.

274,558. DERIVATIVES OF THE ANTHRAQUINONE SERIES, MANUFACTURE OF. W. Carpmael, London. From I. G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. Application date, April 21, 1926.

Specification No. 250,968 (see THE CHEMICAL AGE, Vol. XV, p. 35) describes a process for splitting one or more sulpho groups from *p*-di-(methylamino)-anthrarufin-2:6- or 3:7-disulphonic acids, or *p*-di-(methylamino)-chrysazine-2:7-disulphonic acid, with the intermediate formation of hydrogenated compounds. In this invention, a homonuclear substituted anthraquinone sulphonic acid other than those of Specification No. 250,968, is treated with a hydrosulphite in weak acid or alkaline solution to obtain hydrogenated homonuclear substituted anthraquinone sulphonic acids. Examples are given of the production of the hydrogenated homonuclear substituted anthraquinone sulphonic acid of 1-amino-4-oxy-anthraquinone-3-sulphonic acid, *p*-diamino-anthrarufin-3:7-disulphonic acid, *p*-diamino-chrysazine-2:7-disulphonic acid, *p*-diamino-anthrarufin-6-monosulphonic acid, quinizarine-2-sulphonic acid, purpurin-3-sulphonic acid, 1-aminoanthraquinone-2-sulphonic acid, 1-amino-4-bromanthraquinone-2-sulphonic acid, and 1:5-diamino-anthraquinone-2:6-disulphonic acid. The sulphonic acid group or groups can be split off by the addition of an alkaline reacting reagent, or by heating with concentrated sulphuric acid with or without boric acid, or by heating in aqueous solution.

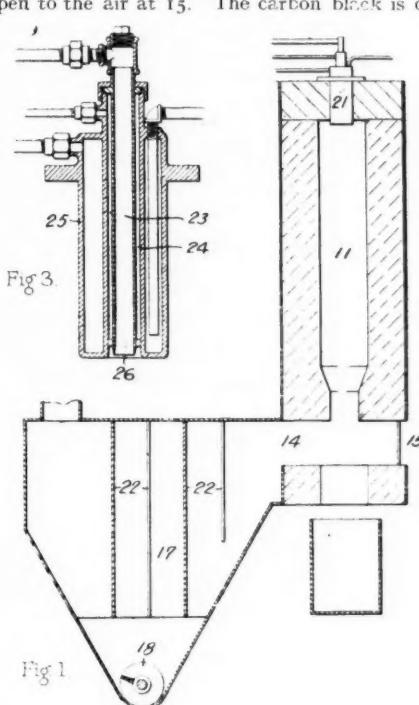
274,562. REDUCTION OF AROMATIC NITRO COMPOUNDS. W. Carpmael, F. London. From I. G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. Application date, April 21, 1926.

The process is for reducing an aromatic nitro compound to an aromatic amine by means of iron and insufficient mineral acid to dissolve it, in such a manner that the resulting iron oxide is obtained in a condition suitable for use as a pigment. The mineral acid is replaced by an acid reacting concentrated aqueous solution of an easily soluble salt of a metal more electro positive than iron, obtained either by acidification of a metallic salt with a mineral acid not in itself a reducing agent, or ob-

tained by hydrolysing the solution of a suitable metallic salt of a mineral acid not in itself a reducing agent. Suitable salts are the chlorides of the alkali and alkaline earth metals, magnesium, zinc, or iron. The iron oxide is usually obtained as a deep black powder, or, in some cases, as a yellow to brown hydrated oxide. The process is applicable to chloro-, oxy-, and amino-nitro compounds, poly-nitro compounds, and nitro-sulphonic acids. Examples are given.

274,573. DISSOCIATION OF CARBONACEOUS GASES OR VAPOURS. H. E. Potts, Liverpool. From Canada Carbine Co., Ltd., 83, Craig Street West, Montreal, Canada. Application date, April 24, 1926.

The process is more particularly for the manufacture of carbon black by the dissociation of acetylene or other endothermic gas by passing the gas into a heated reaction chamber, but previously maintaining it at a temperature sufficiently low to prevent polymerisation up to the moment of admission. A vertical retort 11 of firebrick opens at the bottom into a flue 14 open to the air at 15. The carbon black is collected



#### 274,573

in a chamber 17 having baffles 22 and a screw conveyor 18. The burner 21 at the upper end of the retort is shown enlarged. The acetylene or other gas passes in through a tube 23, and is kept cool by a surrounding passage 24 for air, and by a cooling jacket 25. The lower end of the tube 23 forms a knife edge 26 to prevent adherence of carbon. At starting the gas is completely burnt until the retort 11 is heated to a dull red, and the air supply is then cut off or diminished so that amorphous carbon is produced. The resulting hydrogen is ignited at the bottom of the retort, and the flame prevents the entrance of air and also carries the carbon black into the receiver 17. The flow of acetylene must be regulated so that the carbon black is produced in large flocculent masses. In this apparatus there is no danger of explosion.

274,610. CARBON MONOXIDE AND HYDROGEN FROM HYDROCARBONS, PROCESS FOR PREPARATION OF MIXTURES OF. L. Casale, 9, Via del Parlamento, Rome. Application date, June 2, 1926.

Most hydrocarbons are decomposed into carbon, hydrogen and methane when heated above 1000° C., and the methane finally decomposes but with more difficulty. It has been found that the purity of the hydrogen produced can be increased if the gases are maintained always below atmospheric

pressure, are heated above  $1000^{\circ}\text{C}$ , even if catalysts are present and contain a large excess of steam. Thus a mixture of methane and oxygen with steam may be pre-heated by the heat of a previous reaction, and then heated to  $1100^{\circ}\text{--}1300^{\circ}\text{C}$ . by regulating the amount of oxygen present while the pressure is maintained below atmospheric. The resulting mixture can be employed for the synthesis of alcohol, or it may be converted into a mixture of hydrogen and nitrogen for ammonia synthesis.

**274,700. CHLORANIL AND BROMANIL, MANUFACTURE OF.** L. B. Holliday and Co., Ltd., and C. Shaw, Leeds Road, Deighton, Huddersfield. Application date, November 26, 1926.

Paranitroso-phenol is mixed with 30 per cent. hydrochloric acid and chlorine passed into the mixture while the temperature is raised to  $90^{\circ}\text{C}$ . A light brown amorphous solid is deposited which consists of crude chloranil, and this may be purified by recrystallising from benzene. Paranitroso-phenol may be brominated in glacial acetic acid to obtain bromanil.

**274,763. CRACKING HYDROCARBONS, PROCESS AND APPARATUS FOR.** C. Arnold, London. From Standard Development Co., 26, Broadway, New York. Application date, March 14, 1927.

The process is for cracking the residue of high grade crude oils which have been distilled for the removal of gasoline. A still 1 is provided with internal horizontal flues 3, and is

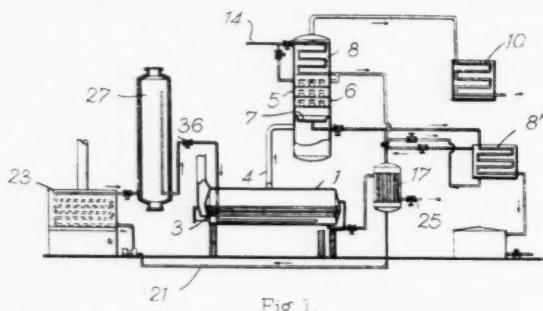


Fig. 1.

### 274,763

connected by a pipe 4 to a fractionator 5 having the usual plates 6, receiving pans 7, heat exchanger 8, and condenser 10. The oil is supplied through a pipe 14 to the preheater 8 and tar heat exchanger 17, and then through pipe 21 to cracking coil 23 where it is raised from about  $500^{\circ}\text{F}$ . to  $850^{\circ}\text{F}$ . at a pressure of 300-350 lb. per square inch. The oil then passes into a reaction chamber 27, and then through an expansion valve 36, where it is reduced to atmospheric pressure, and then passes into the still 1. Hot tar or fuel oil passes from the still 1 into the heat exchanger 17, and is drawn off at 25. An additional heat exchanger 8' may be provided. The heat content of the oil from the chamber 27 is not sufficient to vaporise the oil in the still 1, and additional heat is therefore supplied by passing hot combustion gases through the pipes 3. The cracking is regulated to produce the maximum amount of gasoline without causing more than 0.25 per cent. of sediment in the tar.

**NOTE.—Abstracts of the following specifications which are now accepted, appeared in THE CHEMICAL AGE when they became open to inspection under the International Convention:** 251,270 (I. G. Farbenindustrie Akt.-Ges.) relating to cyclic hydrocarbons and derivatives, see Vol. XV, p. 59; 253,094 (Soc. of Chemical Industry in Basle) relating to urea-formaldehyde condensation products, see Vol. XV, p. 185; 253,550 (J. Blumenfeld) relating to titanium oxide, see Vol. XV, p. 209; 254,726 (Ring Ges. Chemischer Unternehmungen) relating to active silicic acid, see Vol. XV, p. 279; 255,072 (I. G. Farbenindustrie Akt.-Ges.) relating to azo dyestuffs, see Vol. XV, p. 280; 258,901 (G. Austerweil) relating to borneol and isoborneol, see Vol. XV, p. 528; 260,620 (Soc. Italiana Pirelli) relating to regenerating vulcanised rubber, see Vol. XVI, p. 50; 261,395 (F. P. Egeberg) relating to flotation concentration of ores, see Vol. XVI, p. 15 (Metallurgical Section); 263,879 (I. G. Farbenindustrie Akt.-Ges.) relating to dyestuffs of the triarylmethane series, see Vol. XVI, p. 285; 265,984 (Naam-

loze Vennootschap Silica en Ovenbouw Mij) relating to recovery of benzenes from coal gas, see Vol. XVI, p. 402; 268,375 (I. G. Farbenindustrie Akt.-Ges.) relating to alkylated or cycloalkylated aryl sulphonic acids, see Vol. XVI, p. 536; 269,583 (I. G. Farbenindustrie Akt.-Ges.) relating to compounds of aromatic para-diamines and sulphur dioxide, see Vol. XVII, p. 13.

### International Specifications not yet Accepted

**272,864. METHANOL.** Commercial Solvents Corporation, Terre Haute, Ind., U.S.A. (Assignees of J. Woodruff, 1526, South 6th Street, Terre Haute, and G. Bloomfield, 1306, South Center Street, Terre Haute, Ind., U.S.A.) International Convention date, June 21, 1926.

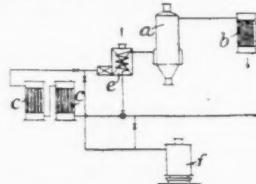
A catalyst for the synthesis of methanol consists of one or more difficultly reducible metal oxides and a metal halide. The oxides are those of metals of the second periodic group, with an added oxide of a metal of the third or seventh group as a promoter, and the halide is used in less than the chemical equivalent of the principal oxide present. A number of examples are given of such catalysts, such as zinc oxide-chromic oxide-zinc chloride, the yield of methanol obtained being stated in each case.

**272,875. SYNTHETIC DRUGS.** Chemische Fabrik auf Actien, vorm. E. Schering, 170, Müllerstrasse, Berlin. International Convention date, June 18, 1926. Addition to 255,434. (See THE CHEMICAL AGE, Vol. XV, p. 307.)

Colourless products are obtained by melting dimethylaminophenyl-dimethyl-pyrazolone with phenylethyl-barbituric acid, the urethane of trichlorethyl-alcohol, and bromodiethyl-acetyl-carbamide.

**272,903. RECOVERING BENZENE.** J. Trautmann, 33, Halskestrasse, Süderde, Berlin. International Convention date, June 16, 1926.

Gas and vapour from a retort or still *a* pass through a condenser *b* to extract water and tar, and some of the gas then



### 272,903

passes through a heater *e* back to the retort as scavenging gas. The remainder passes to a benzene extraction plant *c* and the stripped gas is used to heat the heater *e*. A generator *f* supplies the initial scavenging gas.

**272,908. DYES.** I. G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. International Convention date, June 15, 1926.

Metallic compounds of dyes insoluble in water are obtained by treating the dyes with metallic compounds in the presence of water-soluble organic solvents capable of dissolving the dyes. In examples, the azo dyestuffs from *p*-chlor-*o*-aminophenol and  $\beta$ -naphthol, or 1-phenyl-3-methyl-5-pyrazolone are heated with ethyl alcohol and chromium formate or copper formate to obtain the chromium or copper compounds.

**272,919. SOLUBILISING ALCOHOLS.** H. T. Böhme Akt.-Ges., 29, Moritzstrasse, Chemnitz, and H. Bertsch, Chemnitz, Germany. International Convention date, June 15, 1926.

A dispersing agent for obtaining stable aqueous dispersions or solutions of higher alcohols containing four or more carbon atoms, is made by sulphonating fatty acid from castor oil in the presence of butyric acid at a temperature below zero.

**272,923 and 272,951. ACETIC ANHYDRIDE.** Consortium für Elektrochemische Industrie Ges., 20, Zielstattstrasse, Munich, Germany. International Convention dates, June 16 and 17, 1926.

Acetic anhydride is produced by heating acetic acid vapour to a temperature up to  $800^{\circ}\text{C}$ . with or without a catalyst such as aluminium phosphate, in a chamber of copper or alloys rich in copper, carbon, graphite, and acid-resistant alloys of chromium or nickel such as V2A, VM, Nichrotherm, or Duraloy. The vapour may be preheated before the catalytic treatment.

272,924. DYES. I. G. Farbenindustrie Akt.-Ges., Frankfurt-on-Main, Germany. International Convention date, June 15, 1926.

2-Amino-anthracyanone-9: 10-disulphuric ester is oxidised with caustic soda-alkaline permanganate, acidified, and filtered. The product dyes wool in violet-red shades.

272,967. SULPHONIC ACIDS. I. G. Farbenindustrie Akt.-Ges., Frankfurt-on-Main, Germany. International Convention date, June 21, 1926.

Aliphatic and hydroaromatic hydrocarbons with more than 8 carbon atoms are sulphonated by the use of sulphuric anhydride, fuming sulphuric acid, chlorosulphonic acid, or sulphuric acid above 100° C. The treatment of stearic, palmitic and oleic acids, and paraffin oil is described.

273,244. DICARBOXYLIC ACIDS. J. D. Riedel Akt.-Ges., 1, Riedelstrasse, Britz, Berlin. International Convention date, June 22, 1926. Addition to 265,959. (See THE CHEMICAL AGE, Vol. XVI, p. 402)

Hydroaromatic dicarboxylic acids and their derivatives are obtained by oxidising hydrogenated cyclic alcohols and ketones such as  $\alpha$ - and  $\beta$ -tetrahydronaphthols, hydrindene,  $\alpha$ - and  $\beta$ -decahydronaphthols, in the presence of oxygen carriers such as mercuric oxide, molybdenum pentoxide, vanadium pentoxide, or their salts. Thus, decahydronaphthal may be treated with 60 per cent. nitric acid and vanadate of ammonium to obtain a mixture of cis- and trans-hexahydro-*o*-phenylene-diacetic acid and octahydro-cinnamic-*o*-carboxylic acid.

273,247. DYES. I. G. Farbenindustrie Akt.-Ges., Frankfurt-on-Main, Germany. International Convention date, June 22, 1926.

Hydroxy derivatives of ketones of the perylene series are alkylated by means of arylsulphonic esters of alkyl-, aryl-, or aralkyl-ethers of di- or polyvalent alcohols or thioalcohols. The products are alkyl ethers in which the alkyl group consists of a short carbon chain, to which is attached, through the medium of an oxygen or sulphur atom, a further hydrocarbon radicle. Examples are given in which the oxidation product of dibenzanthrone is heated in trichlorbenzene with sodium carbonate and the toluenesulphonic ester of glycol-monomethyl-ether or -monoethylether, or with glycol-mon-*n*-butylether toluenesulphonate. The products are suitable for dyeing cotton or colouring lacquers.

273,250. PURIFYING GASES. Humphreys and Glasgow, Ltd., 38, Victoria Street, London, S.W.1 (Assignees of W. H. Fulweiler, Wallingford, Pa., U.S.A., and C. W. Jordan, Norwood, Pa., U.S.A.). International Convention date, June 24, 1926.

Gas is scrubbed with sodium carbonate solution containing a small proportion of a soluble iron salt not precipitated by hydrogen sulphide, and the resulting alkali sulphhydrate is stirred by a rotary paddle, and air introduced below the paddle. Sulphur is collected in an annular trough at the liquid level, and revivified solution drawn off through a pipe below.

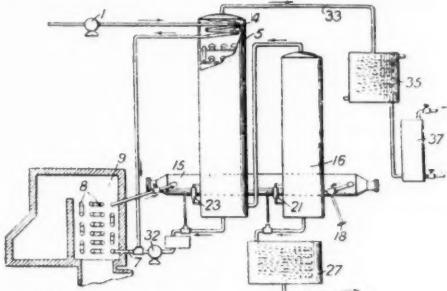
273,276. FATTY ACID ESTERS. E. Wecker, Heilbronn-on-Neckar, Germany. International Convention date, June 23, 1926.

Fatty acids, with or without fatty oils, are esterified with insufficient glycerin or other alcohol, so that an excess of fatty acid is left. This is removed by heating to near its boiling point, and treating with finely divided water, toluene, or alcohol at 10-40 mm. pressure. Examples are given of the esterification of fatty acid and oil mixtures. The process can be combined with the purification of fatty oils containing free fatty acid.

273,256. CRACKING OILS. R. Cross, 700, Baltimore Avenue, Kansas City, Mo., U.S.A. International Convention date, June 28, 1926.

Specification 191,318 describes the cracking of oil by heating it under pressure and passing the hot oil into an enlarged reaction chamber under the same pressure to complete the cracking. The oil in the heating zone is now heated above the critical temperature and pressure of most of its constituents. The oil passes through a preheater 4 to the heating coil 8 in a furnace 9, and then passes to a heavily insulated chamber 15 formed from a single ingot of forged steel. The products pass through a reducing valve 18 to a separator 16

and then to a bubble tower 5. Condensate is drawn off from the tower 16 by a level regulator 21 to a cooler 27, and con-



273,256

densate is drawn off in a similar manner from the tower 5 to pump 32 which returns it to the heater 8. Gases pass off through pipe 33 to condenser 35 and separator 37.

#### LATEST NOTIFICATIONS.

- 275,927. Manufacture and production of benzanthrone derivatives. I. G. Farbenindustrie Akt.-Ges. August 10, 1926.
- 275,933. Manufacture of photographic plates or films. I. G. Farbenindustrie Akt.-Ges. August 12, 1926.
- 275,999. Process for colouring lacquers. I. G. Farbenindustrie Akt.-Ges. August 13, 1926.
- 275,985. Magnesium alloys for use in connection with pistons for internal-combustion engines. I. G. Farbenindustrie Akt.-Ges. August 13, 1926.
- 275,995. Manufacture of condensation products from formaldehyde and thiourea, or a mixture of thiourea and urea. Soc. of Chemical Industry in Basle. August 11, 1926.
- 276,001. Destructive hydrogenation of carbonaceous materials. I. G. Farbenindustrie Akt.-Ges. August 11, 1926.
- 276,010. Process for the manufacture of thymol, its isomers or homologues, and their hydrogenation products. Chemische Fabrik Auf Action (Vorm. E. Schering). August 16, 1926.
- 276,012. Manufacture of  $\alpha$ -amino- $\beta$ -diethyl-amino-2-propanols. I. G. Farbenindustrie Akt.-Ges. August 13, 1926.
- 276,017. Recovery of copper from liquors by precipitation. I. G. Farbenindustrie Akt.-Ges. August 14, 1926.
- 276,024. Manufacture of an anti-serum for prevention or treatment of scarlet fever. I. G. Farbenindustrie Akt.-Ges. August 14, 1926.
- 276,025. Process for opening up materials containing cellulose. I. G. Farbenindustrie Akt.-Ges. August 13, 1926.
- 276,032. Fungicide. I. G. Farbenindustrie Akt.-Ges. August 16, 1926.

#### Specifications Accepted with Date of Application

- 251,982. Carbonaceous material and process for making same. Roessler und Hasslacher Chemical Co. May 9, 1925.
- 252,384. Dyeing cotton with vat and azo dyestuffs, Process for. I. G. Farbenindustrie Akt.-Ges. May 20, 1925.
- 252,707. Iodised pyridine derivatives, Process for the production of. C. Rath. May 28, 1925.
- 253,542. Synthetic camphor, Manufacture of. L. Darrasse, E. Darrasse, and L. Dupont. June 12, 1925.
- 255,086. Mordant dyestuffs, Manufacture of. Durand and Huguenin Akt.-Ges. July 13, 1925.
- 261,406. Polymerised vinyl esters, Manufacture of. Consortium für Elektro Chemische Industrie Ges. November 14, 1925.
- 262,126-7. Malleable iron and steel directly out of oxide ore, Methods and means for producing. E. G. T. Gustafsson. November 28, 1925.
- 262,457. Indigoid dyestuffs, Manufacture of. I. G. Farbenindustrie Akt.-Ges. December 4, 1925.
- 266,004. Coke oven or like plants, Recovery of by-products of. C. Still. February 15, 1926.
- 267,052. Dyeing or printing textile fibres and other materials, Manufacture of products for. Durand and Huguenin Akt.-Ges. March 17, 1926. Addition to 186,057.
- 267,086. Dyeing animal fibres, Processes for. Durand and Huguenin Akt.-Ges. March 22, 1926. Addition to 255,501.
- 268,722. Exothermic chemical reactions, Processes for carrying out. Soc. l'Air Liquide, Soc. Anon. pour l'Etude et l'Exploitation des Procédés G. Claude. April 1, 1926.
- 270,274. Cracking of sludge residues, Process for the treatment of. Naamlooze Vennootschap de Batavia Petroleum Maatschappij and F. Rudolf. April 27, 1926.
- 275,277. Alkoxy-amino-quinolines, Manufacture of. W. Carmael. (I. G. Farbenindustrie Akt.-Ges.) February 4, 1926.
- 275,281. Fluid hydrocarbons, Process of and apparatus for splitting. C. Longhi. March 1, 1926.

275,283. Dyestuffs, Manufacture of. British Alizarine Co., Ltd. W. H. Dawson and P. Beghin. March 4, 1926.

275,284. Organic compounds containing oxygen, Manufacture and production of. J. Y. Johnson. (*I. G. Farbenindustrie Akt.-Ges.*) March 4, 1926.

275,286. Cellulose derivatives and products obtainable therefrom, Manufacture of. H. Dreyfus. March 26, 1926.

275,292. New vat dyestuffs containing sulphur, Manufacture of. W. Carpmael. (*I. G. Farbenindustrie Akt.-Ges.*) April 9, 1926.

275,301. Compounds of the naphthosultam series, and dyestuffs therefrom, Manufacture of. W. Carpmael. (*I. G. Farbenindustrie Akt.-Ges.*) April 29, 1926.

275,307. Dyeing cellulose acetate silk, Process for. O. Y. Imray. (*I. G. Farbenindustrie Akt.-Ges.*) May 1, 1926.

275,313. Mixed phenols and related compounds, Process for producing. R. Cross. May 3, 1926.

275,321. Catalytic oxidation of hydrocarbons. E. C. R. Marks. *E. I. Du Pont de Nemours and Co.* May 3, 1926.

275,326. Dyeing and printing with ice colours. W. Carpmael. (*I. G. Farbenindustrie Akt.-Ges.*) May 4, 1926.

275,344. Refining and separating of metals. H. Harris. May 7, 1926.

275,345. Methanol and other oxygenated organic compounds, Production of. Synthetic Ammonia and Nitrates, Ltd., and H. G. Smith. May 12, 1926.

275,373. Dyeing cellulose esters and ethers, Process for. British Dyestuffs Corporation, Ltd., R. S. Horsfall, L. G. Lawrie and J. Hill. June 11, 1926.

275,377. Catalytic methylation of ammonia and organic amines, Process for. A. Mackert. June 17, 1926.

275,404. Atomising and drying liquids, Apparatus for. A. Nyrop. July 21, 1926.

275,421. Anthraquinone dyes and dyeing therewith. British Dyestuffs Corporation, Ltd., A. Shepherdson, and W. W. Tatton. August 19, 1926.

275,459. Production of solid ammonium carbonate, Process for. Renania Kunheim Verein Chemische Fabriken Akt.-Ges. November 20, 1926. Addition to 262,408.

275,463. Carbonate materials, Treatment of. A. E. White. (*Dwight and Lloyd Metallurgical Co.*) November 26, 1926.

275,536. Crude oils and fats, Process for treating. Metallbank u.d. Metallurgische Ges. Akt.-Ges. August 9, 1926.

275,539. Fungicide. I. G. Farbenindustrie Akt.-Ges. August 5, 1926.

#### Applications for Patents

Arnold, C., and Standard Development Co. Manufacture of hydrocarbons. 20,902. August 8.

Arnold, C., and Standard Development Co. Treatment of hydrocarbon residues, etc. 20,957. August 9.

Azogino Soc. Anon. per la Fabbricazione dell' Ammoniaca Sintetica e Prodotti Derivati, Tanzi, B., and Toniolo, C. Manufacture of non-hygroscopic double salt from calcium nitrate. 21,826. August 18. (Italy, August 19, 1926.)

Bacsá, J. Production of nickel-oxide-electrodes. 20,853. August 8.

Bensa, F. Manufacture of dyestuffs. 20,989. August 9. (Austria, October 2, 1926.)

Blumenfeld, J. Preparation of titanium, etc., compounds. 20,987. August 9. (United States, August 9, 1926.)

British Dyestuffs Corporation, Ltd., and Mendoza, M. Manufacture of intermediate compounds, etc. 21,008. August 10.

British Celanese, Ltd., Ellis, G. H., and Olpin, H. C. Coloration of materials. 21,507. August 16.

British Celanese, Ltd., Ellis, G. H., and Olpin, H. C. Treatment of cellulose derivatives. 21,680. August 17.

Büsching, W. Process for denitration of waste acid mixtures. 21,044. August 9. (Germany, September 3, 1926.)

Carpmael, A., and I. G. Farbenindustrie Akt.-Ges. Electrolysis of brine. 21,626. August 16.

Carpmael, A. Manufacture of green vat dyestuffs. 21,710. August 17.

Carpmael, A. Manufacture of basic ethers of resorcinol. 21,819. August 18.

Carpmael, A. Dyeing acetate silk. 21,820. August 18.

Carpmael, A. Manufacture of *o* and *p* xylene. 21,995. August 20.

Carpmael, A. Process for degreasing raw wool. 21,996. August 20.

Chemische Fabrik auf Actien vorm. E. Schering. Process for manufacture of thymol, etc. 21,221. August 11. (Germany, August 16, 1926.)

Chemische Fabrik auf Actien vorm. E. Schering. Manufacture of disodium salts of sulphonethylaminometalmercapto sulphonic acids. 21,018. August 9. (Germany, February 8.)

Chemische Fabrik Gross-Weissandt, Ges., and Seidler, P. Preparation of large sal-ammoniac crystals. 21,046. August 9. (Germany, August 10, 1926.)

Chemische Fabrik auf Actien vorm. E. Schering and Jordan, H. Manufacture of alkylisoalkylenephenois, etc. 21,485. August 15.

Florentin, J. M. F. D., King, A. J., and Matignon, C. Obtaining light hydrocarbons from organic compounds. 21,203. August 11. (France, December 17, 1925.)

Frankl, M. Separation of gaseous mixtures. 21,206. August 11. (February 18, 1926.)

Geigy Akt.-Ges., J. R. Manufacture of leuco-compounds of vat-dyestuffs. 21,440. August 15. (Germany, August, 16, 1926.)

Grah, R. Chromium plating. 21,191. August 11.

Grothe, H., and Metallhütte Magdeburg Ges. Process for treating copper, etc., containing lyes. 21,209. August 11. (Germany, August 11, 1926.)

Gubelmann, I., and Stallmann, O. 1-amino-2, 4-dichloro-anthraquinone. 21,501. August 15.

Husain, S., and Partington, J. R. Process for production of pseudo-perphosphates. 21,902. August 20.

I. G. Farbenindustrie Akt.-Ges. Production of liquid, etc., hydrocarbons, etc. 20,891, 20,892. August 8. (Germany, August 7, 1926.)

I. G. Farbenindustrie Akt.-Ges. Production of liquid, etc., hydrocarbons. 20,906. August 9. (Germany, August 9, 1926.)

I. G. Farbenindustrie Akt.-Ges. Manufacture of cellulose esters of inorganic acids. 21,007. August 9. (Germany, October 26, 1926.)

I. G. Farbenindustrie Akt.-Ges. Destructive hydrogenation of carbonaceous materials. 21,181. August 11. (Germany, August 11, 1926.)

I. G. Farbenindustrie Akt.-Ges. Manufacture of 1-amino-3-dialkylamino-2-propanols. 21,300. August 12. (Germany, August 13, 1926.)

I. G. Farbenindustrie Akt.-Ges. and Johnson, J. Y. Manufacture of finely-divided azo-colouring matter, etc. 21,790. August 18. (April 12, 1926.)

I. G. Farbenindustrie Akt.-Ges. and Johnson, J. Y. Process of flotation. 21,918. August 19.

I. G. Farbenindustrie Akt.-Ges. and Johnson, J. Y. Manufacture of ammonia. 21,919. August 19.

I. G. Farbenindustrie Akt.-Ges. and Johnson, J. Y. Purification of montan wax. 21,984. August 20.

I. G. Farbenindustrie Akt.-Ges. and Johnson, J. Y. Driers. 21,985. August 20.

I. G. Farbenindustrie Akt.-Ges. and Johnson, J. Y. Production of hydrogen peroxide. 21,986. August 20.

I. G. Farbenindustrie Akt.-Ges. and Johnson, J. Y. Apparatus for separation of solid substances of different specific gravity. 21,987. August 20.

I. G. Farbenindustrie Akt.-Ges. Manufacture of anti-serum for treatment of scarlet fever. 21,441. August 15. (Germany, August 14, 1926.)

I. G. Farbenindustrie Akt.-Ges. Process for opening up materials containing cellulose. 21,442. August 15. (Germany, August 13, 1926.)

I. G. Farbenindustrie Akt.-Ges. Fungicide. 21,597. August 16. (Germany, August 16, 1926.)

I. G. Farbenindustrie Akt.-Ges. Production of photographic films. 21,508. August 16. (Germany, October 16, 1926.)

I. G. Farbenindustrie Akt.-Ges. Manufacture of azo-dyestuffs. 21,892. August 19. (Germany, August 19, 1926.)

Imperial Chemical Industries, Ltd. Oil vapour lamps. 21,602. August 16.

Imperial Chemical Industries, Ltd., and Mendoza, M. Manufacture of pyrazolones, etc. 21,913. August 19.

Imray, O. Y., and I. G. Farbenindustrie Akt.-Ges. Manufacture of ethers of carboxylic acids. 21,006. August 9.

Johnson, J. Y., and I. G. Farbenindustrie Akt.-Ges. Purification of gases. 21,105. August 10.

McDermott, P. J. Purification of benzol, etc. 21,362. August 13.

Neill, O. S. Preparation of iron compound from solutions of iron. 21,045. August 9.

Newport Co. Preparation of para'-hydroxy-ortho-benzoyl-benzoic acid. 21,496. August 15. (United States, November 29, 1926.)

Petersen, H. Manufacture of sulphuric acid. 21,439. August 15. (Germany, August 28, 1926.)

Pharmagans Pharmaceutisches Institut L. W. Gars. Akt.-Ges. Manufacture of phosphatides. 21,706. August 17. (Germany, February 16.)

Riley, F. Dyeing machines. 20,451. August 3.

Robson, S. Manufacture of sulphate of ammonia. 21,623. August 16.

Soc. of Chemical Industry in Basle. Manufacture of condensation products from formaldehyde, etc. 21,113. August 10. (Switzerland, August 11, 1926.)

Soc. of Chemical Industry in Basle. Dyestuff preparations, etc. 21,008. August 9.

Taylor, E. W. Electrodeposition of metals. 21,195. August 11.

Traun, H. O., and Traun und Söhne vorm. Harburger Gummi-Kamm Co., Dr. H. Containers for hydrofluoric acid, etc. 21,073. August 10. (Germany, January 18.)

## Weekly Prices of British Chemical Products

*The prices and comments given below respecting British chemical products are based on direct information supplied by the British manufacturers concerned. Unless otherwise qualified, the figures quoted apply to fair quantities, net and naked at makers' works.*

### General Heavy Chemicals

ACID ACETIC, 40% TECH.—£19 per ton.  
 ACID BORIC, COMMERCIAL.—Crystal, £34 per ton; powder, £36 per ton.  
 ACID HYDROCHLORIC.—3s. 9d. to 6s. per carboy d/d, according to purity, strength, and locality.  
 ACID NITRIC, 80° Tw.—£21 10s. to £27 per ton, makers' works, according to district and quality.  
 ACID SULPHURIC.—Average National prices f.o.r. makers' works, with slight variations up and down owing to local considerations: 140° Tw., Crude Acid, 6s. per ton. 168° Tw., Arsenical, £5 10s. per ton. 168° Tw., Non-arsenical, £6 15s. per ton.  
 AMMONIA ALKALI.—£6 15s. per ton f.o.r. Special terms for contracts.  
 BISULPHITE OF LIME.—£7 10s. per ton, packages extra, returnable.  
 BLEACHING POWDER.—Spot, £9 10s. per ton d/d; Contract, £8 10s. per ton d/d, 4-ton lots.  
 BORAX, COMMERCIAL.—Crystals, £19 10s. to £20 per ton; granulated, £19 per ton; powder, £21 per ton. (Packed in 2-cwt. bags, carriage paid any station in Great Britain.)  
 CALCIUM CHLORIDE (SOLID).—£5 to £5 5s. per ton d/d carr. paid.  
 COPPER SULPHATE.—£25 to £25 10s. per ton.  
 METHYLATED SPIRIT 101 O.P.—Industrial, 2s. 5d. to 2s. 10d. per gall.; pyridinised industrial, 2s. 7d. to 3s. per gall.; mineralised, 3s. 6d. to 3s. 10d. per gall.; 64 O.P., 1d. extra in all cases; prices according to quantity.  
 NICKEL SULPHATE.—£38 per ton d/d.  
 NICKEL AMMONIA SULPHATE.—£38 per ton d/d.  
 POTASH CAUSTIC.—£30 to £33 per ton.  
 POTASSIUM BICHROMATE.—4½d. per lb.  
 POTASSIUM CHLORATE.—3½d. per lb., ex wharf, London, in cwt. kegs.  
 SALAMMONIAC.—£45 to £50 per ton d/d. Chloride of ammonia, £37 to £45 per ton, carr. paid.  
 SALT CAKE.—£3 15s. to £4 per ton d/d. In bulk.  
 SODA CAUSTIC, SOLID.—Spot lots delivered, £15 2s. 6d. to £18 per ton, according to strength; 20s. less for contracts.  
 SODA CRYSTALS.—£5 to £5 5s. per ton, ex railway depots or ports.  
 SODIUM ACETATE 97/98%.—£21 per ton.  
 SODIUM BICARBONATE.—£10 10s. per ton, carr. paid.  
 SODIUM BICHROMATE.—3½d. per lb.  
 SODIUM BISULPHITE POWDER, 60/62%.—£17 10s. per ton for home market, 1-cwt. drums included.  
 SODIUM CHLORATE.—2½d. per lb.  
 SODIUM NITRITE, 100% BASIS.—£27 per ton d/d.  
 SODIUM PHOSPHATE.—£14 per ton, f.o.r. London, casks free.  
 SODIUM SULPHATE (GLAUBER SALTS).—£3 12s. 6d. per ton.  
 SODIUM SULPHIDE CONC. SOLID, 60/65.—£13 5s. per ton d/d. Contract, £13. Carr. paid.  
 SODIUM SULPHIDE CRYSTALS.—Spot, £8 12s. 6d. per ton d/d. Contract, £8 10s. Carr. paid.  
 SODIUM SULPHITE, PEA CRYSTALS.—£14 per ton f.o.r. London, 1-cwt. kegs included.

### Coal Tar Products

ACID CARBOLIC CRYSTALS.—8d. to 9d. per lb. Crude 60's, 2s. 4½d. to 2s. 8d. per gall.  
 ACID CRESYLIC 99/100.—2s. 9d. to 2s. 10d. per gall. 97/99.—2s. 1½d. to 2s. 5d. per gall. Pale, 95%, 2s. to 2s. 3d. per gall. Dark, 1s. 9d. to 2s. 2d. per gall.  
 ANTHRACENE.—A quality, 2½d. to 3d. per unit. 40%, 3d. per unit.  
 ANTHRACENE OIL, STRAINED.—8d. to 8½d. per gall. Unstrained, 7½d. to 8d. per gall.; both according to gravity.  
 BENZOLE.—Crude 65's, 10d. to 10½d. per gall., ex works in tank wagons. Standard Motor, 1s. 3d. to 1s. 3½d. per gall., ex works in tank wagons. Pure, 1s. 6d. to 2s. per gall., ex works in tank wagons.  
 TOLUOLE.—90%, 1s. 4d. to 1s. 9d. per gall. Firm. Pure, 1s. 7d. to 2s. per gall.  
 XYLOL.—1s. 3d. to 2s. per gall. Pure, 2s. 5d. per gall.  
 CREOSOTE.—Cresylic, 20/24%, 10d. to 11d. per gall.; middle oil, 9d. to 10d. per gall. Heavy, 8½d. to 8½d. per gall. Standard specification, 7½d. to 7½d. Salty, 7d. per gall. less 1½%.  
 NAPHTHA.—Crude, 7½d. to 8d. per gall. according to quality. Solvent 90/160, Country, 10d. to 11d. per gall.; London, 1s. 2d. to 1s. 4d. per gall. Solvent 95/160, 1s. 4d. to 1s. 5d. per gall. Solvent 90/190, Country, 10d. to 11d. per gall.; London, 1s. to 1s. 4d. per gall.  
 NAPHTHALENE CRUDE.—Drained Creosote Salts, £7 10s. per ton. Whizzed or hot pressed, £8 10s. to £9 per ton.  
 NAPHTHALENE.—Crystals, £11 10s. to £13 10s. per ton. Quiet. Flaked, £12 10s. to £13 per ton, according to districts.  
 PITCH.—Medium soft, 90s. to 93s. per ton, f.o.b., according to district.  
 PYRIDINE.—90/140, 5s. 9d. to 7s. per gall. 90/180, 4s. 6d. to 5s. per gall. Heavy, 4s. to 4s. 6d. per gall.

### Intermediates and Dyes

In the following list of Intermediates delivered prices include packages except where otherwise stated:  
 ACID AMIDONAPHTHOL DISULPHO (1-8-2-4).—10s. 9d. per lb.  
 ACID ANTHRANILIC.—6s. per lb. 100%.  
 ACID BENZOIC.—1s. 9d. per lb.  
 ACID GAMMA.—4s. 9d. per lb.  
 ACID H.—3s. per lb. 100% basis d/d.  
 ACID NAPHTHIONIC.—1s. 6d. per lb. 100% basis d/d.  
 ACID NEVILLE AND WINSTER.—4s. 9d. per lb. 100% basis d/d.  
 ACID SULPHANILIC.—9d. per lb. 100% basis d/d.  
 ANILINE OIL.—7½d. per lb. naked at works.  
 ANILINE SALTS.—7½d. per lb. naked at works.  
 BENZALDEHYDE.—2s. 3d. per lb.  
 BENZIDINE BASE.—3s. 3d. per lb. 100% basis d/d.  
 BENZOIC ACID.—1s. 8½d. per lb.  
 o-CRESOL 29/31° C.—4½d. per lb. Fair inquiry.  
 m-CRESOL 98/100%.—2s. 7½d. per lb. Only limited inquiry.  
 p-CRESOL 32/34° C.—2s. 8½d. per lb. Only limited inquiry.  
 DICHLORANILINE.—2s. 3d. per lb.  
 DIMETHYLANILINE.—1s. 11d. per lb. d/d. Drums extra.  
 DINITROBENZENE.—9d. per lb. naked at works. £75 per ton.  
 DINITROCHLORBENZENE.—£84 per ton d/d.  
 DINITROTOLUENE.—48/50° C. 8d. per lb. naked at works. 66/68° C. 9d. per lb. naked at works.  
 DIPHENYLAMINE.—2s. 10d. per lb. d/d.  
 a-NAPHTHOL.—2s. per lb. d/d.  
 B-NAPHTHOL.—1s. to 1s. per lb. d/d.  
 a-NAPHTHYLAMINE.—1s. 3d. per lb. d/d.  
 B-NAPHTHYLAMINE.—3s. per lb. d/d.  
 o-NITRANILINE.—5s. 9d. per lb.  
 m-NITRANILINE.—3s. per lb. d/d.  
 p-NITRANILINE.—1s. 8d. per lb. d/d.  
 NITROBENZENE.—6d. per lb. naked at works.  
 NITRONAPHTHALENE.—1s. 3d. per lb. d/d.  
 R. SALT.—2s. 2d. per lb. 100% basis d/d.  
 SODIUM NAPHTHIONATE.—1s. 8½d. per lb. 100% basis d/d.  
 o-TOLUIDINE.—7½d. per lb. naked at works.  
 p-TOLUIDINE.—2s. 2d. per lb. naked at works.  
 m-XYLIDINE ACETATE.—2s. 11d. per lb. 100%.  
 N. W. Acid.—4s. 9d. per lb. 100%.

### Wood Distillation Products

ACETATE OF LIME.—Brown, £9 to £9 5s. per ton. Grey, £15 per ton.  
 Liquor, 9d. per gall. 32° Tw.  
 CHARCOAL.—£6 to £9 per ton, according to grade and locality.  
 IRON LIQUOR.—1s. 3d. per gall. 32° Tw. 1s. per gall. 24° Tw.  
 RED LIQUOR.—9d. to 10d. per gall. 16° Tw.  
 WOOD CREOSOTE.—1s. 9d. per gall. Unrefined.  
 WOOD NAPHTHA, MISCELL.—4s. to 4s. 1d. per gall., 60% O.P. Solvent, 4s. 3d. per gall., 40% O.P.  
 WOOD TAR.—£4 10s. to £5 per ton and upwards, according to grade.  
 BROWN SUGAR OF LEAD.—£40 15s. per ton.

### Rubber Chemicals

ANTIMONY SULPHIDE.—Golden, 6½d. to 1s. 5½d. per lb., according to quality; Crimson, 1s. 4d. to 1s. 6d. per lb., according to quality.  
 ARSENIC SULPHIDE, YELLOW.—1s. 9d. per lb.  
 BARYTES.—£3 10s. to £6 15s. per ton, according to quality.  
 CADMIUM SULPHIDE.—2s. 6d. to 2s. 9d. per lb.  
 CARBON BISULPHIDE.—£20 to £25 per ton, according to quantity.  
 CARBON BLACK.—5½d. per lb., ex wharf.  
 CARBON TETRACHLORIDE.—£45 to £50 per ton, according to quantity, drums extra.  
 CHROMIUM OXIDE, GREEN.—1s. 1d. per lb.  
 DIPHENYL GUANIDINE.—3s. 9d. per lb.  
 INDIARUBBER SUBSTITUTES, WHITE AND DARK.—5½d. to 6½d. per lb.  
 LAMP BLACK.—£35 per ton, barrels free.  
 LEAD HYPOSULPHITE.—9d. per lb.  
 LITHOPONE, 30%.—£22 10s. per ton.  
 MINERAL RUBBER "RUBPRON".—£13 12s. 6d. per ton, f.o.r. London.  
 SULPHUR.—£9 to £11 per ton, according to quality.  
 SULPHUR CHLORIDE.—4d. to 7d. per lb., carboys extra.  
 SULPHUR PRECIP. B.P.—£47 10s. to £50 per ton.  
 THIOCARBAMIDE.—2s. 6d. to 2s. 9d. per lb. carriage paid.  
 THIOCARBANILIDE.—2s. 1d. to 2s. 3d. per lb.  
 VERMILION, PALE OR DEEP.—6s. to 6s. 3d. per lb.  
 ZINC SULPHIDE.—1s. per lb.

### Pharmaceutical and Photographic Chemicals

ACID, ACETIC, PURE, 80%.—£39 per ton ex wharf London in glass containers.  
 ACID, ACETYL SALICYLIC.—2s. 3½d. to 2s. 5d. per lb.  
 ACID, BENZOIC B.P.—2s. to 3s. 3d. per lb., according to quantity. Solely ex Gum, 1s. to 1s. 3d. per oz., according to quantity.

**ACID, BORIC B.P.**—Crystal, 40s. to 43s. per cwt.; powder, 44s. to 47s. per cwt., according to quantity. Carriage paid any station in Great Britain, in ton lots.

**ACID, CAMPHORIC.**—19s. to 21s. per lb.

**ACID, CITRIC.**—Is. 6d. to Is. 7½d. per lb., less 5%.

**ACID, GALLIC.**—2s. 8d. per lb. for pure crystal, in cwt. lots.

**ACID, PYROGALLIC, CRYSTALS.**—7s. 3d. per lb. Resublimed, 8s. 3d. per lb.

**ACID, SALICYLIC, B.P.**—Is. 3d. to Is. 4d. per lb.; Technical.—1½d. to Is. per lb.

**ACID, TANNIC B.P.**—2s. 8d. to 2s. 10d. per lb.

**ACID, TARTARIC.**—Is. 3½d. per lb., less 5%. Firm market.

**AMIDOL.**—9s. per lb., d/d.

**ACETANILIDE.**—Is. 6d. to Is. 8d. per lb. for quantities.

**AMIDOPYRIN.**—8s. 6d. per lb.

**AMMONIUM BENZOATE.**—3s. 3d. to 3s. 6d. per lb., according to quantity.

**AMMONIUM CARBONATE B.P.**—£37 per ton. Powder, £39 per ton in 5 cwt. casks. Resublimed: Is. per lb.

**ATROFINE SULPHATE.**—11s. per oz. for English make.

**BARBITONE.**—6s. per lb.

**BENZONAPHTHOL.**—3s. 3d. per lb. spot.

**BISMUTH CARBONATE.**—9s. 9d. to 10s. per lb.

**BISMUTH CITRATE.**—9s. 6d. to 9s. 9d. per lb.

**BISMUTH SALICYLATE.**—8s. 9d. to 9s. per lb.

**BISMUTH SUBNITRATE.**—7s. 9d. to 8s. per lb.

**BISMUTH NITRATE.**—5s. 9d. to 6s. per lb.

**BISMUTH OXIDE.**—13s. 9d. to 14s. per lb.

**BISMUTH SUCCHLORIDE.**—11s. 9d. to 12s. per lb.

**BISMUTH SUBGALLATE.**—7s. 9d. to 8s. per lb. Extra and reduced prices for smaller and larger quantities respectively; Liquor Bismuth B.P. in W. Qts. Is. 1d. per lb.; 12 W. Qts. Is. per lb.; 36 W. Qts. 11½d. per lb.

**BORAX B.P.**—Crystal, 24s. to 27s. per cwt.; powder, 26s. to 29s. per cwt. according to quantity. Carriage paid any station in Great Britain, in ton lots.

**BROMIDES.**—Potassium, Is. 10½d. to 2s. 0½d. per lb.; sodium, 2s. 1d. to 2s. 3d. per lb.; ammonium, 2s. 3d. to 2s. 5d. per lb.; granulated 4d. per lb. less; all spot.

**CALCIUM LACTATE.**—Is. 2½d. to Is. 3½d. per lb.

**CAMPHOR.**—Refined flowers, 2s. 11d. to 3s. 1d. per lb., according to quantity; also special contract prices.

**CHLOR HYDRATE.**—3s. 6d. per lb., duty paid.

**CHLOROFORM.**—2s. 3d. to 2s. 7½d. per lb., according to quantity.

**CREOSOTE CARBONATE.**—6s. per lb.

**ETHERS.**—Prices for Winchester quarts; dozen Winchester quarts; carboys or drums; and 10 cwt. lots respectively: 730—Is. 2½d.; Is. 2d.; Is. 1½d.; Is. 0½d.; 720 technical—Is. 5½d.; Is. 5d.; Is. 4½d.; Is. 3d.; 720 pur. (Aether B.P., 1914)—2s. 4d.; 2s. 3½d.; 2s. 3d.; 2s. 2d.

**FORMALDEHYDE.**—£39 per ton, in barrels ex wharf.

**GUAIACOL CARBONATE.**—5s. per lb.

**HEXAMINE.**—2s. 4d. to 2s. 6d. per lb.

**HOMATROFINE HYDROBROMIDE.**—30s. per oz.

**HYDRASTINE HYDROCHLORIDE.**—English make offered at 120s. per oz.

**HYDROGEN PEROXIDE (12 VOL).**—Is. 4d. per gallon, f.o.r. makers' works, naked. B.P., 10 vols., bulk, 2s. to 2s. 3d. per gal.; Winchester, 2s. 11d. to 3s. 6d. per gal.; 20 vols., bulk, 4s. to 4s. 3d. per gal.; Winchester, 5s. to 6s. per gal.

**HYDROQUINONE.**—2s. 11d. per lb., in cwt. lots.

**HYPOPHOSPHITES.**—Calcium, 3s. 6d. per lb., for 28-lb. lots; potassium, 4s. 1d. per lb.; sodium, 4s. per lb.

**IRON AMMONIUM CITRATE.**—B.P., 2s. 1d. to 2s. 4d. per lb. Green, 2s. 4d. to 2s. 9d. per lb. U.S.P., 2s. 2d. to 2s. 5d. per lb.

**IRON PERCHLORIDE.**—4d. per lb., 22s. per cwt.

**MAGNESIUM CARBONATE.**—Light commercial, £31 per ton net.

**MAGNESIUM OXIDE.**—Light commercial, £62 10s. per ton, less 2½%; Heavy Commercial, £21 per ton, less 2½%; in quantity lower; Heavy Pure, 2s. to 2s. 3d. per lb., in 1 cwt. lots.

**MENTHOL.**—A.B.R. recrystallised B.P., 18s. 6d. per lb. net; Synthetic detached crystals, 9s. 6d. to 12s. 9d. per lb., according to quantity; Liquid (95%), 11s. 3d. per lb.

**MERCURIALS B.P.**—Up to 1 cwt. lots, Red Oxide, 7s. 6d. to 7s. 7d. per lb., levig., 7s. to 7s. 1d. per lb.; Corrosive Sublimate, Lump, 5s. 9d. to 5s. 10d. per lb., Powder, 5s. 2d. to 5s. 3d. per lb.; White Precipitate, Lump, 5s. 11d. to 6s. per lb., Powder, 6s. to 6s. 1d. per lb., Extra Fine, 6s. 1d. to 6s. 2d. per lb.; Calomel, 6s. 4d. to 6s. 5d. per lb.; Yellow Oxide, 6s. 10d. to 6s. 11d. per lb.; Persulph., B.P.C., 6s. 1d. to 6s. 2d. per lb.; Sulph. nig., 5s. 10d. to 5s. 11d. per lb. Special prices for larger quantities.

**METHYL SALICYLATE.**—Is. 9d. per lb.

**METHYL SULPHONAL.**—9s. 6d. to 9s. 9d. per lb.

**METOL.**—11s. per lb. British make.

**PARAFORMALDEHYDE.**—Is. 9d. per lb. for 100% powder.

**PARALDEHYDE.**—Is. 4d. per lb.

**PHENACETIN.**—2s. 9d. to 3s. per lb.

**PHENAZONE.**—4s. 3d. to 4s. 6d. per lb.

**PHENOLPHTHALEIN.**—6s. to 6s. 3d. per lb.

**POTASSIUM BITARTFATE 99/100% (Cream of Tartar).**—100s per cwt. less 2½% for ton lots.

**POTASSIUM CITRATE.**—B.P.C., 1911; Is. 8d. to Is. 11d. per lb. U.S.P.: Is. 11d. to 2s. 2d. per lb.

**POTASSIUM FERRICYANIDE.**—Is. 9d. per lb., in cwt. lots.

**POTASSIUM IODIDE.**—16s. 8d. to 17s. 2d. per lb. according to quantity.

**POTASSIUM METABISULPHITE.**—6d. per lb., 1-cwt. kegs included, f.o.r. London.

**POTASSIUM PERMANGANATE.**—B.P. crystals, 6d. per lb., spot.

**QUININE SULPHATE.**—2s. per oz., Is. 8d. to Is. 9d. for 1000 oz. lots in 100 oz. tins.

**RESORCIN.**—3s. 9d. to 4s. per lb., spot.

**SACCHARIN.**—55s. per lb.; in quantity lower.

**SALOL.**—2s. 4d. per lb.

**SODIUM BENZOATE, B.P.**—Is. 10d. to 2s. 2d. per lb.

**SODIUM CITRATE, B.P.C.**, 1911; Is. 8d. to Is. 11d. per lb., B.P.C., 1923—2s. to 2s. 1d. per lb. for 1 cwt. lots. U.S.P., Is. 11d. to 2s. 2d. per lb., according to quantity.

**SODIUM FERROCYANIDE.**—4d. per lb., carriage paid.

**SODIUM HYPOSULPHITE, PHOTOGRAPHIC.**—£15 5s. per ton, d/d consignee's station in 1-cwt. kegs.

**SODIUM NITROPRUSSIDE.**—16s. per lb.

**SODIUM POTASSIUM TARTRATE (ROCHELLE SALT).**—9os. to 95s. per cwt. Crystals, 5s. per cwt. extra.

**SODIUM SALICYLATE.**—Powder, Is. 8½d. to Is. 9d. per lb. Crystal, Is. 9d. to Is. 10d. per lb.

**SODIUM SULPHIDE, PURE RECRYSTALLISED.**—10d. to Is. 2d. per lb.

**SODIUM SULPHIDE, ANHYDROUS.**—£27 10s. to £28 10s. per ton, according to quantity; 1-cwt. kegs included.

**SULPHONAL.**—6s. 6d. to 6s. 9d. per lb.

**TARTAR EMETIC, B.P.**—Crystal or powder, 2s. 1d. to 2s. 2d. per lb.

**THYMOL.**—Puriss., 10s. to 10s. 3d. per lb., according to quantity. Firmer. Natural, 15s. per lb.

**Perfumery Chemicals**

**ACETOPHENONE.**—6s. 6d. per lb.

**AUBEPINE (EX ANETHOL).**—10s. 6d. per lb.

**AMYL ACETATE.**—2s. per lb.

**AMYL BUTYRATE.**—5s. 3d. per lb.

**AMYL SALICYLATE.**—3s. per lb.

**ANETHOL (M.P. 21/22° C.).**—5s. 6d. per lb.

**BENZYL ACETATE FROM CHLORINE-FREE BENZYL ALCOHOL.**—2s. per lb.

**BENZYL ALCOHOL FREE FROM CHLORINE.**—2s. per lb. per lb.

**BENZALDEHYDE FREE FROM CHLORINE.**—2s. 6d. per lb.

**BENZYL BENZOATE.**—2s. 6d. per lb.

**CINNAMIC ALDEHYDE NATURAL.**—17s. per lb.

**COUMARIN.**—10s. per lb.

**CITRONELLOL.**—13s. 9d. per lb.

**CITRAL.**—8s. 3d. per lb.

**ETHYL CINNAMATE.**—6s. 6d. per lb.

**ETHYL PHTHALATE.**—2s. 9d. per lb.

**EUGENOL.**—8s. 6d. per lb.

**GERANIOL (PALMAROSA).**—18s. 6d. per lb.

**GERANIOL.**—6s. 6d. to 10s. per lb.

**HELiotropine.**—4s. 9d. per lb.

**Iso Eugenol.**—13s. 6d. per lb.

**LINALOL.**—Ex Bois de Rose, 15s. per lb. Ex Shui Oil, 10s. 6d. per lb.

**LINALYL ACETATE.**—Ex Bois de Rose, 18s. 6d. per lb. Ex Shui Oil, 14s. 6d. per lb.

**METHYL ANTHRANILATE.**—8s. 6d. per lb.

**METHYL BENZOATE.**—4s. per lb.

**MUSK KETONE.**—35s. per lb.

**MUSK XYLOL.**—8s. 6d. per lb.

**NEROLIN.**—4s. 6d. per lb.

**PHENYL ETHYL ACETATE.**—12s. per lb.

**PHENYL ETHYL ALCOHOL.**—10s. 6d. per lb.

**RHODINOL.**—32s. 6d. per lb.

**SAFROL.**—18s. 6d. per lb.

**TERPINEOL.**—1s. 8d. per lb.

**VANILLIN.**—1s. to 18s. per lb.

**Essential**

**ALMOND OIL.**—11s. per lb.

**ANISE OIL.**—3s. per lb.

**BERGAMOT OIL.**—28s. per lb.

**BOURBON GERANIUM OIL.**—14s. 6d. per lb.

**CAMPHOR OIL.**—75s. per cwt.

**CANANGA OIL, JAVA.**—26s. per lb.

**CINNAMON OIL LEAF.**—6d. per oz.

**CASSIA OIL, 80/85%.**—7s. 6d. per lb.

**CITRONELLA OIL.**—Java, 85/90%, Is. 11d. per lb. Ceylon, pure, Is. 9d. per lb.

**CLOVE OIL.**—6s. per lb.

**EUCALYPTUS OIL, 75/80%.**—2s. 3d. per lb.

**LAVENDER OIL.**—Mont Blanc, 38/40%, Esters, 22s. 6d. per lb.

**LEMON OIL.**—8s. per lb.

**LEMONGRASS OIL.**—4s. 6d. per lb.

**ORANGE OIL, SWEET.**—11s. 3d. per lb.

**OTTO OF ROSE OIL.**—Anatolian, 30s. per oz. Bulgarian, 75s. per oz.

**PALMA ROSA OIL.**—10s. 6d. per lb.

**PEPPERMINT OIL.**—Wayne County, 17s. 6d. per lb.; Japanese, 8s. 3d. per lb.

**PETITGRAIN OIL.**—7s. 9d. per lb.

**SANDALWOOD OIL.**—Mysore, 26s. 6d. per lb.; 90/95%, 16s. 6d. per lb.

## London Chemical Market

The following notes on the London Chemical Market are specially supplied to THE CHEMICAL AGE by Messrs. R. W. Greeff & Co., Ltd., and Messrs. Chas. Page & Co., Ltd., and may be accepted as representing these firms' independent and impartial opinions.

London, August 25, 1927.

BUSINESS has been steady during the past week and prices remain exceedingly firm.

Export trade is quiet.

### General Chemicals

**ACETONE** is in fair demand, price firm at about £62 per ton, with special quotation for quantities.

**ACID ACETIC** is in steady demand at £37 to £38 per ton, for 80% grade.

**ACID FORMIC** is a fair market, price firm at about £47 per ton for 85% technical quality.

**ACID LACTIC** is quiet, but firm at about £43 per ton for 50% by weight.

**ACID OXALIC** is quietly steady, price unchanged.

**ALUMINA SULPHATE** is in better inquiry, price about £5 10s. for 17-18%.

**ARSENIC**.—Unchanged.

**BAIRUM CHLORIDE** is in moderate demand, price about £8 to £9 10s. per ton, ex warehouse.

**COPPER SULPHATE**.—Unchanged at about £23 per ton.

**EPSOM SALTS** are in good demand, but the first-hand price tends to be a little easier.

**FORMALDEHYDE** is in fair demand at about £40 per ton for 40% by volume.

**LEAD ACETATE** is quiet at £43 to £44 per ton for white, with brown £1 per ton less.

**LEAD NITRATE**.—Unchanged at £38 per ton.

**LIME ACETATE**.—Unchanged.

**METHYL ALCOHOL** is firm at £61 10s. to £62 per ton for high grade material.

**POTASSIUM CHLORATE** is a steady market at about £25 per ton.

**POTASSIUM PERMANGANATE** is advanced in price and is quoted at 8d. per lb.

**POTASSIUM PRUSSIATE** remains in small demand; price is firm at about £62 per ton.

**SODA ACETATE** is in much better demand; price tends upwards, current figure being £19 per ton.

**SODA BICHROMATE**.—Unchanged.

**SODA CHLORATE** is in good demand, price about £25 per ton.

**SODA HYPOSULPHITE** is very quiet at recent levels.

**SODA NITRITE** is in better request and is quoted at £19 10s. to £20 per ton.

**SODA PHOSPHATE**.—Unchanged at about £21 10s. per ton.

**SODA PRUSSIATE**.—Unchanged at 4½d. to 4½d. per lb.

**SODA SULPHIDE**.—Unchanged.

**ZINC SULPHATE**.—Unchanged.

### Coal Tar Products

There is very little change to report in the market for coal tar products since last week.

**BENZOL**.—The position of the benzol market is unchanged since last week. 90's benzol is still very weak, and is quoted at 1s. 4d. to 1s. 5d. per gallon on rails, while the motor quality is quoted at 1s. 1½d. to 1s. 2½d. per gallon.

**PURE BENZOL** is quoted at 1s. 7½d. to 1s. 8½d. per gallon on rails.

**CREOSOTE OIL** is very firm, the price in the North being 7½d. per gallon on rails, while the price in London is about 8½d. per gallon.

**CRESYLC ACID** is slightly weaker. The pale quality 97/99% can be bought at 2s. 2d. per gallon ex works, while the dark quality 95.97% is worth about 1s. 11d. per gallon.

**SOLVENT NAPHTHA** is weak, and can be bought at about 10d. per gallon on rails.

**HEAVY NAPHTHA** is unchanged, at about 11d. per gallon on rails.

**NAPHTHALENES** are firmer, especially the higher grades; £6 15s. to £7 per ton is being paid for the 74/76 quality, while the 76/78 quality is quoted at about £8 to £8 15s. per ton.

**PITCH**.—The market remains steady. Little interest is shown on the whole, but prices are maintained at about 85s. f.o.b. U.K. ports.

### Latest Oil Prices

**LONDON**.—August 24.—**LINSEED OIL** closed dull and 2s. 6d. to 7s. 6d. lower. Spot, ex mill, £32; August, £31 2s. od.; September-December, £31 10s.; January-April, £32 2s. 6d. **RAPE OIL** firm. Crude, extracted, £42; technical, refined, £44 10s., naked, ex wharf. **COTTON OIL** firm and 10s. higher. Refined, common, edible, £40 10s.; Egyptian, crude, £35 10s.; deodorized, £42 10s. **TURPENTINE**, steady, but slow, at 10d. per cwt. advance. American spot, 41s. 9d.; September-December, 42s. 9d. per cwt.

**HULL**.—August 24.—**LINSEED OIL**.—Spot to August-September, £32; January-April, £32 5s. per ton, naked. **COTTON OIL**.—Bombay crude, £34 10s.; Egyptian crude, £35 10s.; edible refined, £39; technical, £38; deodorized, £41 per ton, naked. **PALM KERNEL OIL**.—Crushed, 5½ per cent., £37 10s. per ton, naked. **GROUNDNUT OIL**.—Crushed, extracted, £42; deodorized, £46 per ton. **SOYA OIL**.—Extracted, £33 10s.; deodorized, £37. **RAPE OIL**.—Crude/extracted, £42; refined, £44 per ton, net cash terms, ex mill.

### Nitrogen Products

**Export**.—The demand for sulphate of ammonia continued active and the market remains firm at £9 5s. 6d. to £9 8s. per ton, f.o.b., U.K. port in single bags. It is understood that the price at which sulphate of ammonia is now being offered has stimulated demand on the Continent and that outlet is being found for the increased production. Production is normal in the United Kingdom and it is reported that makers are not inconvenienced by heavy stocks.

**Home**.—August is normally a quiet month in the home market. The amount of sulphate required for immediate consumption is negligible. It is reported that large merchants in various parts of the country have been covering their forward requirements.

**Nitrate of Soda**.—Nitrate is being offered f.o.r. at U.K. ports at about £10 15s. per ton. The demand in the United Kingdom for this commodity becomes smaller each year on account of the lower offerings of sulphate. The nitrate market has been quieter of late, and the price has receded to 16s. 3d. per metric quintal, f.a.s. Chile. Production is on the increase. It is expected that a large demand will set in later in the year when merchants are covering the season's requirements.

### The Cut in Sulphate Prices

We have received the following communication from a well-known chemical firm, on the subject of sulphate of ammonia prices. The prices we published on August 6 were those fixed and announced by Nitram, Ltd., and there might easily be variations from this standard in the case of producers and merchants outside that organisation.—

"We observe that in your issue of the 6th instant, under the heading 'The Cut in Sulphate Prices,' you state that the detailed figures announced by Nitram, Ltd., show that the price of £9 18s. per ton for August represents a drop of £2 8s. per ton, or nearly 20 per cent.

"Will you please allow us to point out to you that your statement is not entirely in accordance with the facts? You will no doubt recollect that during the autumn of last year conditions in this country were abnormal owing to the coal strike, in consequence of which no sulphate of ammonia was being offered for home trade during August, 1926, but the price for neutral quality sulphate of ammonia for home trade, for delivery during September, 1926, was £11 7s. per ton. The price for the neutral quality sulphate of ammonia, for home trade for delivery during September, 1927, is £10 per ton, which, therefore, shows a reduction of £1 7s. per ton.

"We admit that the reduction in the price is considerable, but you will observe that the reduction is very much less than £2 8s. per ton, and we consider that it may lead to confusion and misunderstanding if it is broadcast that sulphate of ammonia prices have been reduced by £2 8s. per ton, whereas the real reduction in price, and comparing prices month by month during 1926 and 1927, amounts to only £1 7s. per ton, or about 12 per cent. instead of 20 per cent. We believe you should bring this matter to the notice of the readers of your valuable paper."

DISEASES OF OCCUPATION in Great Britain and Northern Ireland reported during July under the Factory and Workshop Act included three cases of aniline poisoning and two cases of chrome ulceration (one in the dyeing and finishing trade).

## Scottish Chemical Market

*The following notes on the Scottish Chemical Market are specially supplied to THE CHEMICAL AGE by Messrs. Charles Tennant and Co., Ltd., Glasgow, and may be accepted as representing the firm's independent and impartial opinions.*

*Glasgow, August 24, 1927*

During the past week business in the heavy chemical market has been rather quiet, but inquiry, particularly for export, has been a little better. Prices remain on the same level as last reported.

### Industrial Chemicals

**ACID ACETIC.**—98/100%. £5 to £67 per ton, according to quality and packing c.i.f. U.K. ports; 80% pure £37 10s. per ton, ex wharf; 80% technical £37 10s. per ton, ex wharf.

**ACID BORIC.**—Crystal, granulated or small flakes £34 per ton; powder £36 per ton, packed in bags, carriage paid U.K. stations.

**ACID CARBOLIC, ICE CRYSTALS.**—Still in poor demand and price unchanged at about 8d. per lb., f.o.b. U.K. ports.

**ACID CITRIC B.P. CRYSTALS.**—Rather easier and price now about 1s. 6d. per lb. less 5% ex store for English material. Continental quoted 1s. 7d. per lb., less 5% ex wharf.

**ACID HYDROCHLORIC.**—Usual steady demand. Arsenical quality 4s. 9d. per carboy. Dearsenicated quality 6s. 3d. per carboy, ex works.

**ACID NITRIC 80%.**—Quoted £23 5s. per ton, ex station, full truck loads.

**ACID OXALIC.**—In moderate demand and now offered at 2½d. per lb., ex store, spot delivery.

**ACID SULPHURIC.**—144° £3 12s. 6d. per ton; 168° £7 per ton, ex works, full truck loads. Dearsenicated quality 20s. per ton more.

**ACID TARTARIC B.P. CRYSTALS.**—Quoted 1s. 3½d. per lb., less 5%, ex wharf.

**ALUMINA SULPHATE 17/18%.**—IRON FREE.—Spot material quoted £5 12s. 6d. per ton, ex store. On offer for early delivery at £5 5s. per ton c.i.f. U.K. ports.

**ALUM POTASH.**—Lump quality on offer from the continent £8 5s. per ton c.i.f. U.K. ports. Powdered 2s. 6d. per ton less. Lump on spot offered at £9 2s. 6d. per ton, ex store.

**AMMONIA ANHYDRIDE.**—Unchanged at about 9d. per lb., carriage paid. Containers extra and returnable.

**AMMONIA CARBONATE.**—Lump £37 per ton; powdered £39 per ton, packed in 5 cwt. casks delivered or f.o.b. U.K. ports.

**AMMONIA LIQUID 88%.**—Unchanged at about 2½d. to 3d. per lb. delivered according to quantity.

**AMMONIA MURIATE.**—Grey galvanizers crystals of English manufacture quoted £23 to £24 per ton, ex station. Continental on offer at about £19 12s. 6d. per ton c.i.f. U.K. ports. Fine white crystals of continental manufacture quoted £17 5s. per ton, c.i.f. U.K. ports.

**ARSENIC, WHITE POWDERED.**—Rather easier now. Quoted £18 15s. per ton, ex wharf, early delivery. Spot material available at about £19 10s. per ton, ex store.

**BAIRIUM CARBONATE 98/100%.**—Continental now offered at £7 10s. per ton, c.i.f. U.K. ports.

**BAIRIUM CHLORIDE 98/100%.**—Large white crystals quoted £6 17s. 6d. per ton, c.i.f. U.K. ports.

**BARYTES.**—English material unchanged at £5 5s. per ton, ex works. Continental quoted 5s. per ton, c.i.f. U.K. ports.

**BLEACHING POWDER.**—Contract price to consumers £8 per ton, ex station, minimum 4 ton lots. Spot material 10s. per ton extra. Continental on offer at £7 5s. per ton, ex wharf.

**BORAX.**—Granulated £19 10s. per ton; crystals £20 per ton; powder £21 per ton, carriage paid U.K. ports.

**CALCIUM CHLORIDE.**—English manufacturer's price unchanged at £5 to £5 5s. per ton, ex store, with a slight reduction for contracts. Continental material lower at about £3 12s. 6d. per ton, c.i.f. U.K. ports.

**COPPERAS, GREEN.**—Unchanged at about £3 10s. per ton, f.o.r. works or £4 12s. 6d. per ton, f.o.b. U.K. ports for export.

**COPPER SULPHATE.**—Continental material now quoted £23 15s. per ton, ex wharf. British material on offer at £23 10s. per ton, f.i.b. U.K. ports.

**FORMALDEHYDE 40%.**—Unchanged at £38 per ton, c.i.f. U.K. ports. Spot material quoted £39 5s. per ton, ex store.

**GLAUBER SALTS.**—English material unchanged at £4 per ton, ex store or station. Continental quoted £2 15s. per ton, c.i.f. U.K. ports.

**LEAD, RED.**—Imported material quoted £30 per ton, ex store.

**LEAD, WHITE.**—Quoted £31 per ton, ex store.

**LEAD ACETATE.**—White crystals offered from the Continent at £42 7s. 6d. per ton, c.i.f. U.K. ports. Brown about £40 5s. per ton, c.i.f. U.K. ports. White crystals offered on spot at about £43 15s. per ton, ex store.

**MAGNESITE, GROUND CALCINED.**—Quoted £8 10s. per ton, ex store. In moderate demand.

**POTASH, CAUSTIC 88/92%.**—Solid quality quoted £28 15s. per ton, c.i.f. U.K. ports, minimum 15 ton lots. Under 15 ton lots £29 10s. per ton. Liquid £15 per ton, minimum 15 ton lots. Under 15 ton lots £15 7s. 6d. per ton c.i.f. U.K. ports.

**POTASSIUM BICHROMATE.**—Unchanged at 4½d. per lb., delivered.

**POTASSIUM CARBONATE.**—96/98% unchanged at £27 5s. per ton, ex wharf, prompt shipment. Spot material quoted £28 10s. per ton, c.i.f. U.K. ports.

**POTASSIUM CHLORATE.**—Rather cheaper offers from the continent. Powdered quality now quoted £22 10s. per ton, c.i.f. U.K. ports. Crystals £2 per ton extra.

**POTASSIUM NITRATE.**—Unchanged at £20 7s. 6d. per ton, c.i.f. U.K. ports. Spot material quoted £21 5s. per ton, ex store.

**POTASSIUM PERMANGANATE B.P. CRYSTALS.**—Quoted 6½d. per lb., ex store, spot delivery.

**POTASSIUM PRUSSIATE (YELLOW).**—Rather easier now quoted 6½d. per lb., ex store spot delivery.

**SODA CAUSTIC.**—Powdered 98/99%, £19 7s. 6d. per ton; 76/77%, £15 10s. per ton; 70/72%, £14 10s. per ton, carriage paid station. Minimum 4-ton lots on contract. Spot material, 10s. per ton extra.

**SODIUM ACETATE.**—English material quoted £21 10s. per ton, ex store. Continental on offer at £17 15s. per ton, c.i.f. U.K. ports.

**SODIUM BICARBONATE.**—Refined recrystallised quality £10 10s. per ton, ex quay or station. M.W. quality 30s. per ton less.

**SODIUM BICHROMATE.**—Quoted 3½d. per lb. delivered buyers' works.

**SODIUM CARBONATE (SODA CRYSTALS).**—£5 to £5 5s. per ton, ex quay or station; Powdered or pea quality, £1 7s. 6d. per ton. Alkali 58%, £8 12s. 3d. per ton, ex quay or station.

**SODIUM HYPOSULPHITE.**—Large crystals of English manufacture quoted £9 10s. per ton, ex store. Minimum 4-ton lots. Continental on offer at about £8 2s. 6d. per ton, ex wharf, prompt shipment. Pea crystals of British manufacture quoted £15 5s. per ton, ex station, 4-ton lots.

**SODIUM NITRITE 100%.**—Quoted £10 15s. per ton, ex store.

**SODIUM PRUSSIATE (YELLOW).**—In moderate demand and price unchanged at about 4½d. per lb., ex store. Offered for prompt shipment from the Continent at 4½d. per lb., ex wharf.

**SODIUM SULPHATE (SALTCAKE).**—Price for home consumption, £3 7s. 6d. per ton, ex works.

**SODIUM SULPHIDE.**—Prices for English material as follows: 60/62% solid, now £10 10s. per ton; broken, £11 10s. per ton; flake £13 5s. per ton; crystals, 31/34%, £7 10s. per ton to £8 5s. per ton, according to quality delivered your works, minimum 4-ton lots on contract. Prices for spot delivery, 5s. per ton higher for solid, 2s. 6d. per ton for crystals. Offered from the Continent at about £9 5s. per ton, c.i.f. U.K. ports. Broken, 15s. per ton extra.

**SULPHUR.**—Flowers, £12 10s. per ton; roll, £11 per ton; rock, £11 per ton; floristella, £10 per ton; ground American, £9 5s. per ton; ex store. Prices nominal.

**ZINC CHLORIDE.**—British material, 98/100%, quoted £24 15s. per ton, f.o.b. U.K. ports; 98/100% solid, on offer from the Continent at about £21 15s. per ton, c.i.f. U.K. ports. Powdered, 20s. per ton extra.

**ZINC SULPHATE.**—Continental material, now quoted £11 5s. per ton, ex wharf.

**NOTE.**—The above prices are for bulk business and are not to be taken as applicable to small parcels.

### Intermediates

**H. ACID.**—3s. per lb., 100%. Some inquiries.

**DIMETHYLANILINE.**—1s. 11d. per lb. Small inquiries.

**ALPHA NAPHTHYLAMINE.**—1s. 3d. per lb. Some inquiries.

**METANITRANILINE.**—3s. per lb. Some inquiries.

### Gas Undertakings in Great Britain

PART I of the return relating to authorised gas undertakings in Great Britain for the year 1926 has been issued by the Board of Trade (published by H.M. Stationery Office; price 5s. net). This part contains particulars of the gas manufactured and sold by the 784 authorised undertakings. Part II, which will be issued later, will contain particulars of the finance of these undertakings and of the prices charged for gas. The return gives particulars of the make and consumption of gas, materials used, quantities of residuals made, number of consumers, etc., for each of the 784 undertakings.

## Manchester Chemical Market

(FROM OUR OWN CORRESPONDENT.)

*Manchester, August 25, 1927.*

BUYING of chemicals on the Manchester market for home trade consumption remains on a relatively restricted scale. In many cases individual requirements are satisfied by comparatively small purchases to meet early needs, and aggregate sales are naturally affected in consequence. Although here and there a certain amount of easiness in prices is to be observed, the tone generally is quite steady, and in a few instances values have acquired added firmness compared with last week.

### Heavy Chemicals

A fair trade is being put through in bicarbonate of soda, and quotations are well held at £10 10s. per ton. There is still little activity to be observed in respect of saltcake, but values of this remain at round £3 12s. 6d. per ton. More or less similar dull conditions obtain in the case of glauber salts, offers of which are being made at about £3 7s. 6d. per ton. Phosphate of soda is maintained at £3 12s. 6d. per ton, although there is only a quiet trade passing. Chlorate of soda meets with a limited demand, but the price position seems to be rather stronger than recently, at from 2½d. to 3d. per lb. Caustic soda is moving off in fair quantities, and values keep firm at from £14 10s. to £16 10s. per ton, according to quality. Hyposulphite of soda is a steady section, although business is limited, commercial selling at £9 15s., and photographic crystals at £16 10s. Nitrite of soda is in moderate demand at from £19 to £19 5s. per ton. A quietly steady trade in bicarbonate of soda is being put through, and values are unchanged at about 3d. per lb. Alkali is well held at round £6 15s. per ton, and enquiry for this is fairly active. The demand for prussiate of soda is of limited extent, but there has been little change in the price situation compared with last week, offers being in the neighbourhood of 4d. per lb. Sulphide of soda is dull, and the tendency is easy, 60 to 65 per cent. concentrated solid being on offer at £11 per ton, and the commercial material at round £8 10s.

With regard to the potash compounds, chlorate continues to attract comparatively little buying interest, but prices are steadier and about unchanged at 3d. per lb. Caustic potash is moving off in fair quantities, and quotations are held at £31 per ton. Current offers of carbonate of potash are at about £27 per ton, and a quietly steady business is being done. Yellow prussiate of potash is in limited request, and prices are on the easy side at round 6½d. per lb. Bichromate of potash meets with a moderate demand, and values are maintained at 4d. per lb. Enquiry for permanganate of potash has been slow during the past week; B.P. quality is unchanged at about 6½d. per lb., but commercial is somewhat easier at 5d.

Under the stimulus of a more active demand, arsenic has firmed up again, current quotations for white powdered, Cornish makes, ranging from £17 10s. to £18 per ton, at the mines. Sulphate of copper keeps steady, and is in moderate enquiry for shipment at up to £25 10s. per ton, f.o.b. There is not much stirring in the case of acetate of lime, but grey quality is still being offered at about £15 10s. per ton, and brown at £8 7s. 6d. Acetate of lead is about maintained at £40 per ton for brown and £42 for white, but there seems to be only a limited trade passing in these. Nitrate of lead is quiet but fairly steady at round £38 per ton.

### Acids and Tar Products

Acetic acid is in moderate request, and quotations are quite steady at round £66 per ton for glacial material and £37 10s. for the 80 per cent. commercial. Oxalic acid is not particularly active, but from 3½d. to 3½d. per lb. is being asked for this product. In the absence of any buying of importance the tendency in the case of both citric and tartaric acids seems to be somewhat easier, the former at 1s. 7d. per lb. or slightly under, and the latter at about 1s. 3d.

Where buying interest in any of the tar products is at all keen actual business is restricted by reason of the shortage. This applies to some extent both to pitch and creosote oil, values of which are firm at £4 10s. per ton and from 7½d. to 7¾d. per gallon respectively. The demand for carbolic acid crystals is rather quiet at 7½d. to 8d. per lb., but crude material remains scarce and firm at 2s. 6d. per gallon. Solvent naphtha is still in very poor request, and prices remain weak at round 1s. per gallon, delivered.

## A Recent "Anti-Knock" Investigation

**Aeronautical Research Committee Report**

THE Aeronautical Research Committee has just issued (as Reports and Memoranda, No. 1079 (E.24)) a "Summary by the Secretary Engine Sub-Committee of a Report on Anti-Knock Investigations," by A. Egerton, F.R.S., and S. F. Gates, B.Sc., M.A. (H.M. Stationery Office, pp. 13, 9d.) The first investigations described in this report are those relating to the detonation of gaseous mixtures in tubes, the gas being ignited by a high-tension spark and the progress of the flame recorded photographically on sensitised paper travelling at a speed of some 10 metres per second. Under uniform conditions, which had to be determined experimentally, it was found that detonation started consistently at the same position in the tube, and experiments were carried out with acetylene-oxygen and pentane-oxygen complete-combustion mixtures, to determine the effect on this position of (a) varying the proportion of diluent gas, (b) varying the nature of the diluent (nitrogen, oxygen, argon, carbon dioxide and excess fuel), (c) varying the initial pressure, (d) varying the initial temperature, and (e) adding "anti-knocks." The latter included selenium diethyl, iron carbonyl, bismuth triethyl, lead tetraethyl, nickel carbonyl, tellurium diethyl, tin tetraethyl, and bismuth triphenyl.

The report suggests the experiments show that the use of anti-knocks retards the initial processes of combustion, and that the anti-knock is acting as a negative catalyst. It concludes with a brief description of some ten theories that have been advanced in explanation of the action of anti-knocks, including Professor Callendar's nuclear drop theory and the pyrophoric multiple ignition theory.

### Death of Professor H. R. Procter

PROFESSOR HENRY RICHARDSON PROCTER, D.Sc., F.R.S., who for 22 years was head of the Leather Industries Department of the Yorkshire College and Leeds University, died on Wednesday, August 17, at Newlyn, Cornwall. Professor Procter, who was 79, was the doyen of leather chemists. He received his education at Bootham School, York, and the Royal College of Chemistry and School of Mines. Professor Procter began his work at Leeds University, then known as the Yorkshire College, in 1891, and there was a notable expansion of activities when, in 1897, the present Leather Industries Department was established. Under his very able guidance the Department quickly became world-famous. Dr. Procter's books on his subject were very numerous, and he carried out much research on the standardisation of the analysis of tanning materials, the swelling of gelatine, etc. He remained at the head of the Leather Industries Department of Leeds University until 1913, when he reached the age limit of 65 years, but he retained his official connection with the department as Emeritus Professor, and during the War returned to the University to take charge of the department. On his retirement, a fund amounting to over £1,800 was raised for the establishment of an international research laboratory at Leeds. This was informally opened in October, 1914, with Professor Procter himself as its first honorary director. He was one of the founders of the International Association of Leather Trade Chemists, of the British section of which body he was for a time president, and at his death he was an honorary president of the Association. In May, 1912, he received the freedom and livery of the Leather Sellers' Company.

### Explosion at Manchester Gasworks

OVER twenty persons were injured and two huge gas-holders were wrecked in an explosion at Manchester on Tuesday. The holders were two of six at the Bradford Road works of the City Corporation, and had a total capacity of 3,500,000 cubic feet. The blowing up of one container succeeded the other in the space of a second or so. Fears were entertained regarding the safety of a third holder, and the police caused residents to evacuate the danger area. Thanks to the labours of the firemen, this danger was averted, which was fortunate, as the third gasometer was of 8,000,000 cubic feet capacity, being one of the largest in the world. Of the injured, eight were labourers employed at the works, and six children who were at play in the road.

## Company News

INTERNATIONAL PAINT AND COMPOSITION CO.—An interim dividend of 3 per cent., less tax, is announced.

JOHN OAKES AND SONS.—The directors recommend an interim dividend of 2½ per cent. on the ordinary shares. A similar distribution was made last year.

BENN BROTHERS, LTD.—At a meeting of the directors held on August 19 Mr. A. R. Pain, Mr. E. G. Benn, and Mr. V. Gallancz were appointed directors of the company.

PENNSYLVANIA WATER AND POWER.—A dividend of \$0.62½ per share has been declared on common shares for quarter ended September 30, payable on October 1, to shareholders of record on September 16.

UNITED TURKEY RED.—An interim dividend has been declared on the ordinary shares at the rate of 3 per cent., actual, less tax. No interim payment was made last year, payment for the period being 5 per cent., less tax.

PINCHIN, JOHNSON AND CO., LTD.—The profits for the half-year ended June 30 last show a very substantial increase over the corresponding period of the previous year, and the directors have resolved to declare an interim dividend of 10 per cent., actual, less tax, on the issued ordinary shares of the company, payable on September 1.

F. STEINER AND CO., LTD.—After charging £53,745 for repairs and depreciation, a loss of £28,854 is reported for the year. The directors have transferred from revenue reserve £70,000 and after payment of debenture interest and preference dividend, and deducting the year's loss, the balance of £30,758 is carried forward to next year.

## Chemical Trade Inquiries

The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.

CHEMICALS, DRUGS, PERFUMES, ETC.—An Indian firm of commission agents in Karachi desire to represent British manufacturers for North-West India. (Reference No. 152.)

PORTLAND CEMENT.—The Director-General, India Store Department, Branch No. 10, Belvedere Road, Lambeth, London, S.E.1, invites tenders for 15,000 casks of Portland cement, tropical, normal setting. Tenders due 9th September, 1927. Specifications and forms of tender are obtainable from the above at a fee of 5s. per set, which will not be returned.

PARAFFIN WAX, BEESWAX, AND TALLOW.—A Belgian agent at Antwerp desires to secure the agency, on a commission basis, of British exporters. (Reference No. 158.)

HEAVY AND FINE CHEMICALS, EXCEPT PHENOLS AND CRESOLS.—An agent in Dusseldorf desires to secure the representation of a British firm for Western Germany on a commission basis. (Reference No. 162.)

CAUSTIC SODA, ETC.—A firm in Buda-Pesth desires to secure the representation, on a commission basis, of British houses. (Reference No. 167.)

COAL TAR, LIME, CEMENT, FERTILISERS, ETC.—An importer in Algeria who intends shortly to start in business in Oran desires to obtain the representation of British exporters. (Reference No. 169.)

## Tariff Changes

UNION OF SOUTH AFRICA.—Regulations passed recently, to come into force in January, 1928, provide that no fertiliser or farm food shall be sold within the Union unless previously registered with the Department of Agriculture, and deal in detail with packing, analysis, etc.

AUSTRIA.—Reduced customs duties on certain Czechoslovak and United Kingdom goods imported into Austria are detailed in the *Board of Trade Journal* for August 18, 1927.

ITALY.—The valuation of certain essential oils, synthetic perfumes, alkaloids and alkaloid salts on which a duty of 15 per cent. is payable has recently been revised, the new valuations being in most cases higher than was formerly the case. The full list is given in the *Board of Trade Journal* for August 18, 1927.

## New Chemical Trade Marks

### Applications for Registration

This list has been specially compiled for us from official sources by Gee and Co., Patent and Trade Mark Agents, Staple House, 51 and 52, Chancery Lane, London, W.C.2, from whom further information may be obtained, and to whom we have arranged to refer any inquiries relating to Patents, Trade Marks and Designs.

Opposition to the Registration of the following Trade Marks can be lodged up to September 10, 1927.

"ARTESQUE."

482,135. Class 2. Chemical substances used for agricultural, horticultural, veterinary and sanitary purposes. Aladdin Industries, Ltd., 118, Southwark Street, London, S.E.1; manufacturers. July 1, 1927. (To be associated, Sect. 24.)

"NEPTAL."

482,137. Class 3. Chemical substances prepared for use in medicine and pharmacy. Les Etablissements Poulen Frères (a joint stock company organised under the laws of France), 86 to 92, Rue Vieille-du-Temple, Paris, France; manufacturers. July 1, 1927. (To be associated, Sect. 24.)

"LANSOLAC."

482,197. Class 3. Chemical substances prepared for use in medicine and pharmacy. William James Patey, trading as Roberts and Co., 70, New Bond Street, London, W.1; chemist. July 5, 1927. (To be associated, Sect. 24.)

"TEMPINO."

482,234. Class 3. Chemical substances prepared for use in medicine and pharmacy. Hermann Temmler, trading as Temmler-Werke Vereinigte Chemische Fabriken, Flugplatz 6, Berlin-Johannisthal, Germany; manufacturer. July 6, 1927. (To be Associated, Sect. 24.) Address for service in the United Kingdom: c/o Mewburn, Ellis and Co., 70 and 72, Chancery Lane, London, W.C.2.

Opposition to the Registration of the following Trade Marks can be lodged up to September 17, 1927.



473,369. Class 1. Collodion cotton wet and pyroxylin wet, being chemical substances for use in manufactures. Hercules Powder Co. (a corporation organised and existing under the laws of the State of Delaware), 900, Market Street, Wilmington, New Castle County, Delaware, U.S.A.; manufacturers. September 25, 1926. (To be associated, Sect. 24.)

"HERCULES."

473,584. Class 1. Collodion cotton wet and pyroxylin wet, being chemical substances for use in manufactures. Hercules Powder Co. (a corporation organised and existing under the laws of the State of Delaware), 900, Market Street, Wilmington, New Castle County, Delaware, U.S.A.; manufacturers. October 4, 1926. (To be associated, Sect. 24.)

"PERLANO."

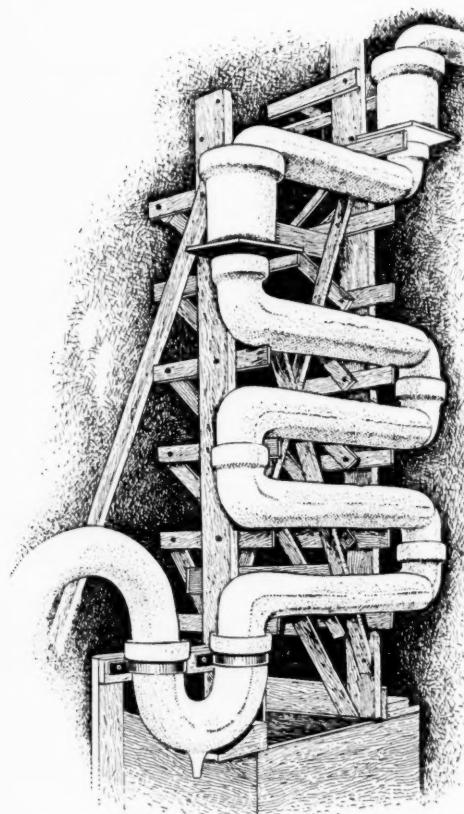
478,593. Class 1. Chemical substances for use in the dyeing industry. H. Th. Bohme Aktiengesellschaft (a joint stock company organised under the laws of Germany), 29, Moritzstrasse, Chemnitz, Germany; manufacturers. March 8, 1927.

"LEONIL."

479,362. Class 1. Chemical substances used as emulsifying agents and for facilitating the wetting of fibrous materials such as textile fibres and fabrics. I. G. Farbenindustrie Aktiengesellschaft (a joint stock company organised under the laws of Germany), Mainzerlandstrasse 28, Frankfort-on-Main, Germany; manufacturers. March 31, 1927.

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THESE VESSELS set up Vertically one above the other can be thoroughly Water Cooled.

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## Commercial Intelligence

*The following are taken from printed reports, but we cannot be responsible for any errors that may occur.*

### County Court Judgments

[NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court judgments against him.]

HUTCHINSON, J., AND CO., Nemlin Chemical Works, Whitefield, chemical manufacturers. (C.C., 27/8/27.) £17 14s. 8d. August 6.

TRAVIS, S. H., AND CO., 33-35a, Kings Road, N.W., chemists. (C.C., 27/8/27.) £27 os. 6d., June 7; And £17 11s. 3d., July 5.

### Deed of Arrangement

JACKSON, Frederick, and JACKSON, Ernest, trading at Smedley Bridge Works, Cheetham, as Joseph Jackson, bleachers, dyers and finishers. (D.A., 27/8/27.) Filed (by order, on terms) August 17. Trustees, G. A. Orme, 71, King Street, Manchester, C.A., and another. Secured creditors, £7,500; liabilities unsecured, £18,266; assets, less secured claims, £8,500.

### Bill of Sale

KILPATRICK, Archibald Sterling, 2, Danesway, Bury Old Road, Prestwich, manufacturing chemist. (B.S., 27/8/27.) Filed August 18. £150.

### Mortgages and Charges

[NOTE.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an \*—followed by the date of the Summary, but such total may have been reduced.]

HOLDERS SOAP WORKS, LTD., London, N.W. (M. 27/8/27.) Reg. August 8, £1,000 deb., to J. Nolan, White Gables, Hillcroft Crescent, Ealing; general charge.

### London Gazette, &c.

#### Companies Winding Up Voluntarily

VITAMOGEN, LTD. (C.W.U.V., 27/8/27.) E. D. Bennett, Briary Cottage, Crondall, Hampshire, appointed as liquidator, August 15. Meeting of creditors at 63, Leather Lane, London, Wednesday, August 31, at 3 p.m.

HYDROME, LTD. (C.W.U.V., 27/8/27.) W. A. Rainbird, Capel House, 54, New Broad Street, E.C.2, Incorporated Accountant, appointed as liquidator, August 11.

BELL, SONS, AND CO., LTD. (C.W.U.V., 27/8/27.) By special resolution, July 29, confirmed August 15.

### New Companies Registered

BERUTUN, LTD., 314-316, Moorgate Station Chambers, Moorfields, London. Registered August 20. Nom. capital, £100 in 1s. shares. Manufacturers, exporters and importers of and dealers in paints, tar-products and other preservatives, etc. Directors : S. Fawns and Louisa King.

SUPER PRODUCTS, LTD. Registered August 19. Nom. capital, £1,000 in £1 shares. Manufacturing, research and analytical chemists, chemical manufacturers, manufacturers of and dealers in chemicals, intermediates, etc. Director : A. Myddleton, 84, Park Road, Blackpool.

### Empire Mining Congress

#### Plan for Review of Imperial Mineral Possibilities

In welcoming the delegates from all parts of the Empire to the second triennial Empire Mining and Metallurgical Congress, at Montreal, on Monday, Sir Robert Horne, M.P., the honorary president, in a comprehensive review of the Empire's mineral resources and needs, stated that the history of civilisation was one of an advancing knowledge of metals, and that man was progressive in proportion as he utilised these metals and acquired knowledge of them. There was no country in which such rapid progress had been made in mineral development as Canada, and she was only at the edge of her discoveries.

Sir Thomas Holland, on behalf of the Institution of Mining and Metallurgy, London, submitted the proposal that in each Dominion or Colony committees of specialists should be appointed for the duty of reviewing its mineral resources and smelting capabilities. Such survey should not be limited, he said, to cataloguing the resources in raw materials, for it was essential to know how far requirements in finished products could be supplied. He noted that the British Empire produced about one-quarter of the total world's mineral production of nearly 2,000,000,000 tons. But the Empire was not independent and completely self-contained in respect of mineral requirements, and he suggested that it might be desirable to carry surplus stocks of vital mineral necessities, which could be drawn upon in any temporary emergency, such as, for instance, in the case of nickel in the time of the Great War. A resolution embodying the suggestions contained in Sir Thomas Holland's paper was proposed by Mr. R. E. Palmer, president of the Institution of Mining and Metallurgy, and was carried unanimously by the delegates.

### American Chromium Imports

CHROMIUM is one of the few essential metals of which the United States does not produce supplies sufficient for its economic needs. Although the United States is by far the largest consumer of this metal, domestic production is now practically negligible, while imports in 1926 exceeded 200,000 tons. Chromium is used in the making of chromium steels which possess great hardness combined with toughness. The metal is also a constituent of rustless steel, stainless steel, and other special alloys. It is of great importance in the chemical industries and is extensively used as a refractory. The United States possesses large reserves of low-grade, high-cost chromite, which would be sufficient to meet domestic needs for six or seven years at the present rate of consumption, though a lowering of standard grades and a rise in price would both be necessary to bring about the mining of such reserves. Consumption and production of chromium in the United States illustrate how an industry of considerable magnitude may depend entirely upon uncontrolled sources for its raw material.

### Benn Brothers' Other Journals

THE CABINET MAKER.—Special Dominions Issue: Modern Furniture and the Dominion Market; Dominion Home Ideas; Empire Timbers for Furniture; Inside Some Dominion Homes; Woodbending Machinery; Illustrated News for Woodworkers.

THE ELECTRICIAN.—Factory Cable Protection, by J. O. Knowles, M.A.; Loaded Telegraph Cables, by J. J. Gilbert; Electrical Contractions, by "Feeder Box"; Inventions and Patents, by J. Hettinger.

THE FRUIT GROWER.—Research in Strawberry Culture; Guernsey Growers' Marketing Problems; Fruit Preservation.

THE GAS WORLD.—Producing and Selling Household Ammonia; Concrete Roads and Gaspipes; Elementary Thoughts on Gas Distribution, by Walter Hole.

GARDENING ILLUSTRATED.—Growing Peaches and Nectarines in Pots; Herbaceous Phloxes at Ryecroft Nurseries; Miss Jekyll and her Garden.

THE HARDWARE TRADE JOURNAL (Dominion and Colonial Issue)—Empire Trade Development; Canada's Sixty Years of Progress; Indian Trade Problems; Hardware Opportunities in Australasia; Packing Tools for Export; Selling Overseas; Questions for the Manufacturer.

THE TIMBER TRADES JOURNAL.—Facts About British Timber; The Position in Latvia; Trinidad's Timbers.

